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A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP

Vol. XXXII No. 12

DECEMBER 1961

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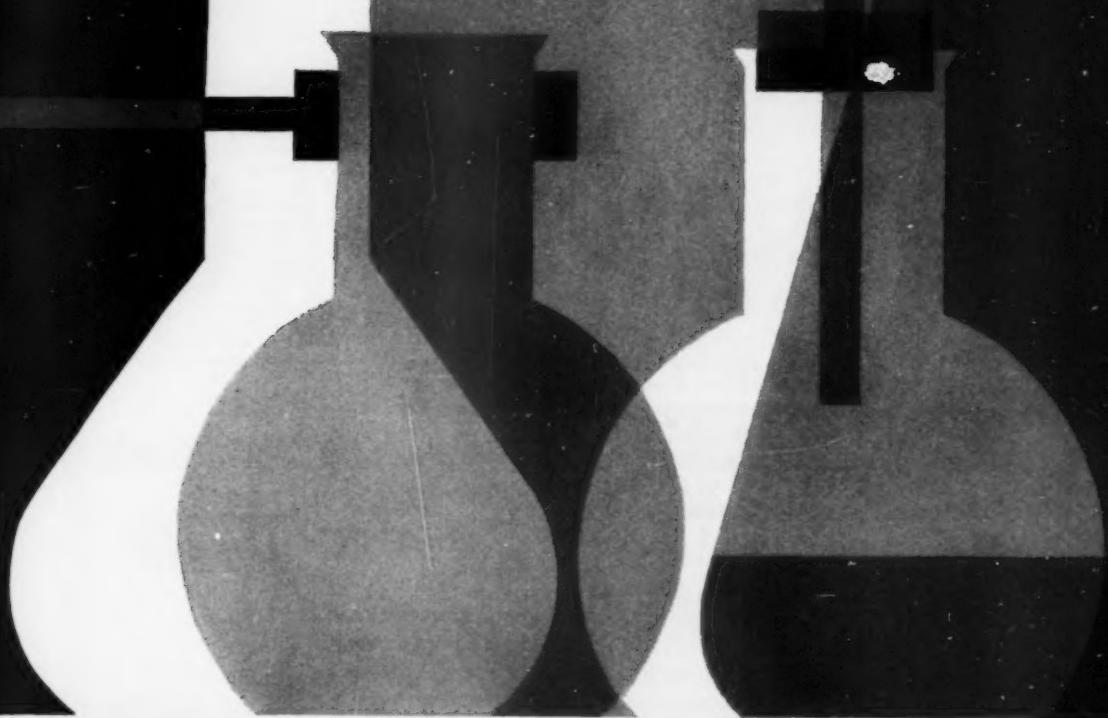
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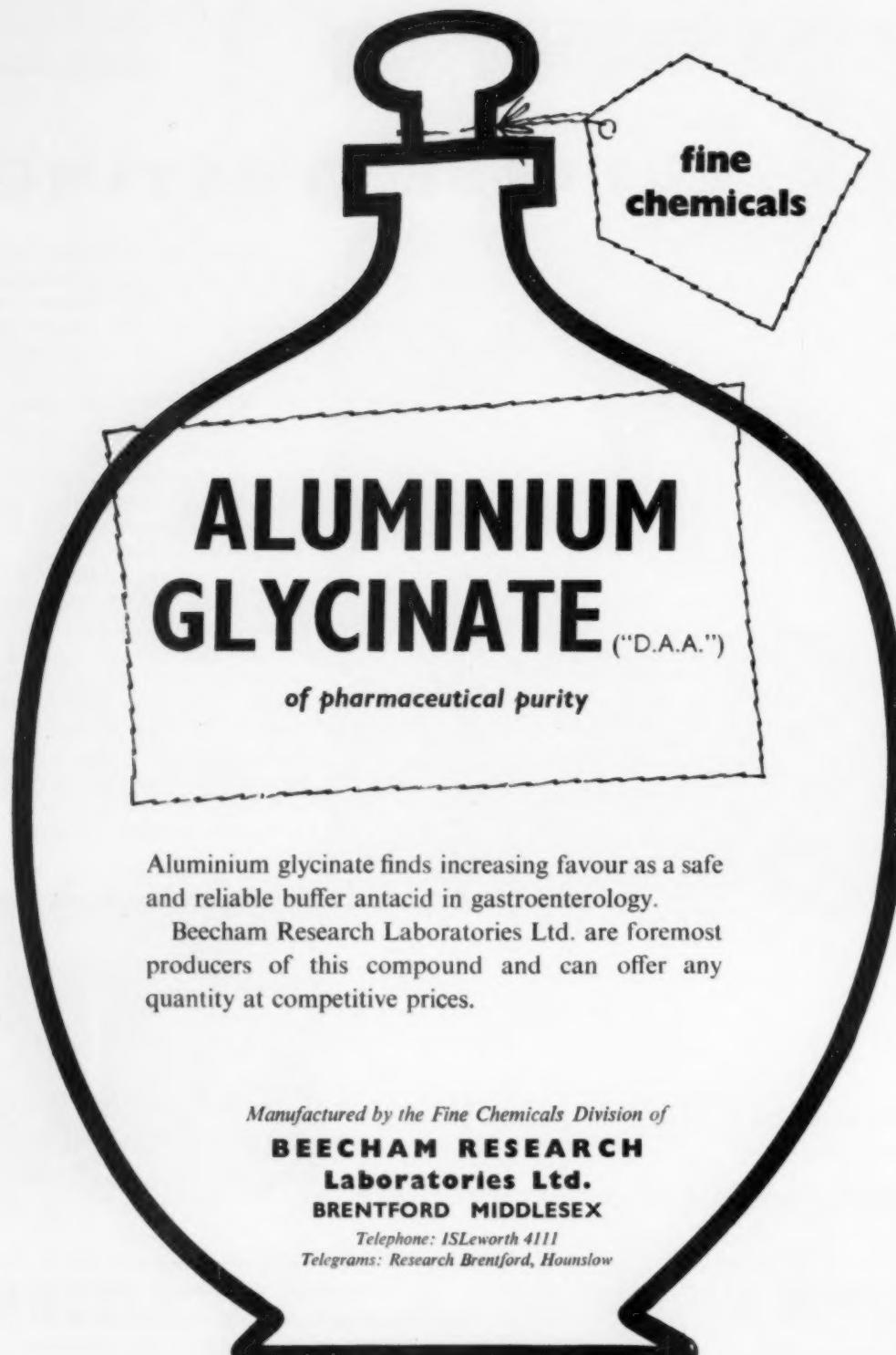
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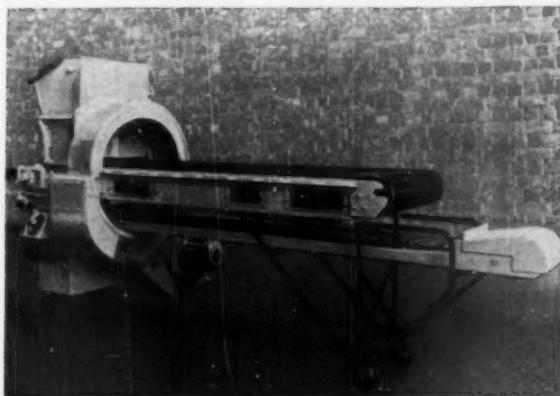
COAL—AND THE BOILERHOUSE

But any programme of modernisation must start with the scrapping or adapting of obsolete systems in favour of *modern* installations. Coal—traditional fuel of

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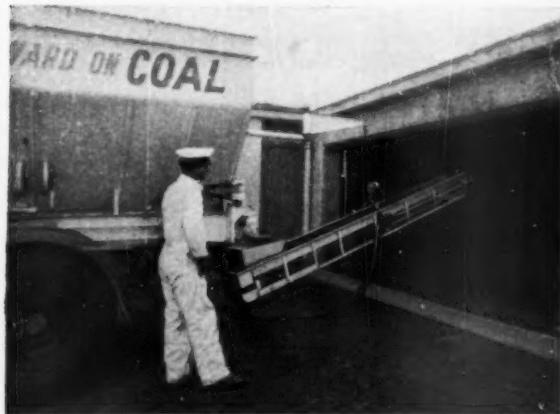


A chain grate stoker ready for installation in any type of boiler.

But to obtain the maximum heat at the lowest cost, coal should be mechanically stoked. A mechanical stoker fitted with special automatic controls, automatically feeds the right amount of coal for the boiler load, even when the load is varying; it burns coal at optimum efficiency all the time without the emission of smoke (thus complying with regulations in Smoke Control Areas); and it virtually replaces the human element in boiler operation. There are many types of mechanical stokers, of which the most commonly used are chain grate, coking, sprinkler and underfeed stokers. Standard models are available for all sizes of boilers.

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merchants; handling is being mechanised. You can be sure of getting a suitable grade of coal—when you want it, where you want it—for our coalfields contain enough coal to satisfy *all* the demands of British industry for centuries to come.

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A Free Film Service

As an additional service, a series of instructional films have been produced by the N.C.B. film unit, which show how outdated hand fired boilers can be converted to mechanical firing and give examples of the financial savings. *There is no charge for this film service.*

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For these services contact your Regional Sales Office of the National Coal Board.

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GOING FORWARD ON**

COAL

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EBONITE PUMP, non-immersion type. Made in 3 sizes : 200, 375, 600 gallons/hour.



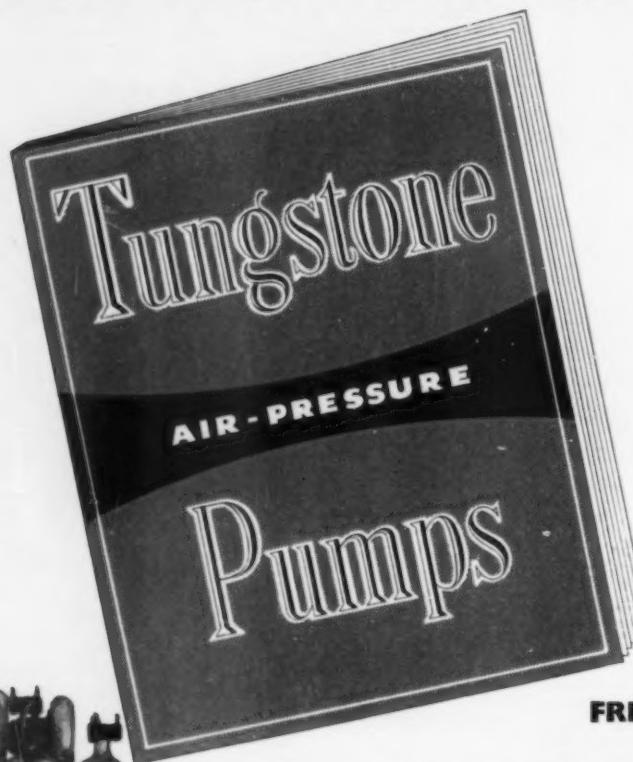
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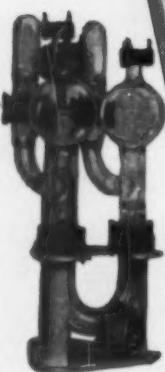


Which particular liquid in your business presents its pumping problem? Is it an acid, a slurry, a sludge . . . gritty, greasy, corrosive, erosive, sticky? A TUNGSTONE Pump will quickly take care of that—as many industries have proved.

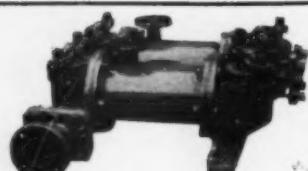
These fine pumps specially evolved for the handling of 'awkward' liquids have two valuable features : (a) the unit can be supplied in a range of materials which resist corrosion by any particular liquid, (b) there are no packings or glands within the unit and there is nothing to clog or choke—air is used as a piston, although it never mixes with the liquid : maintenance costs are negligible.

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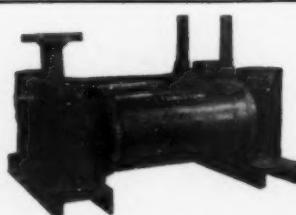


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A13



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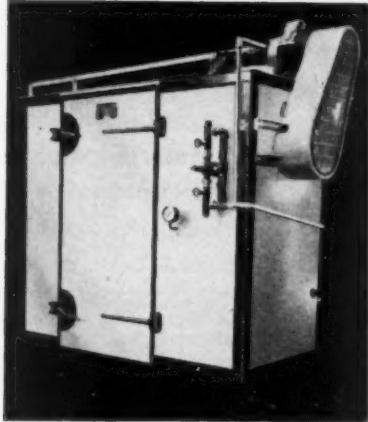
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or
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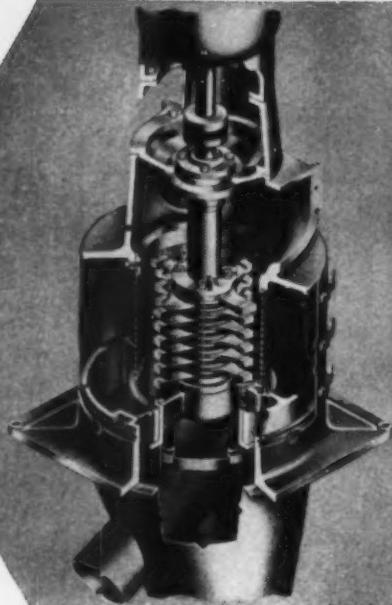
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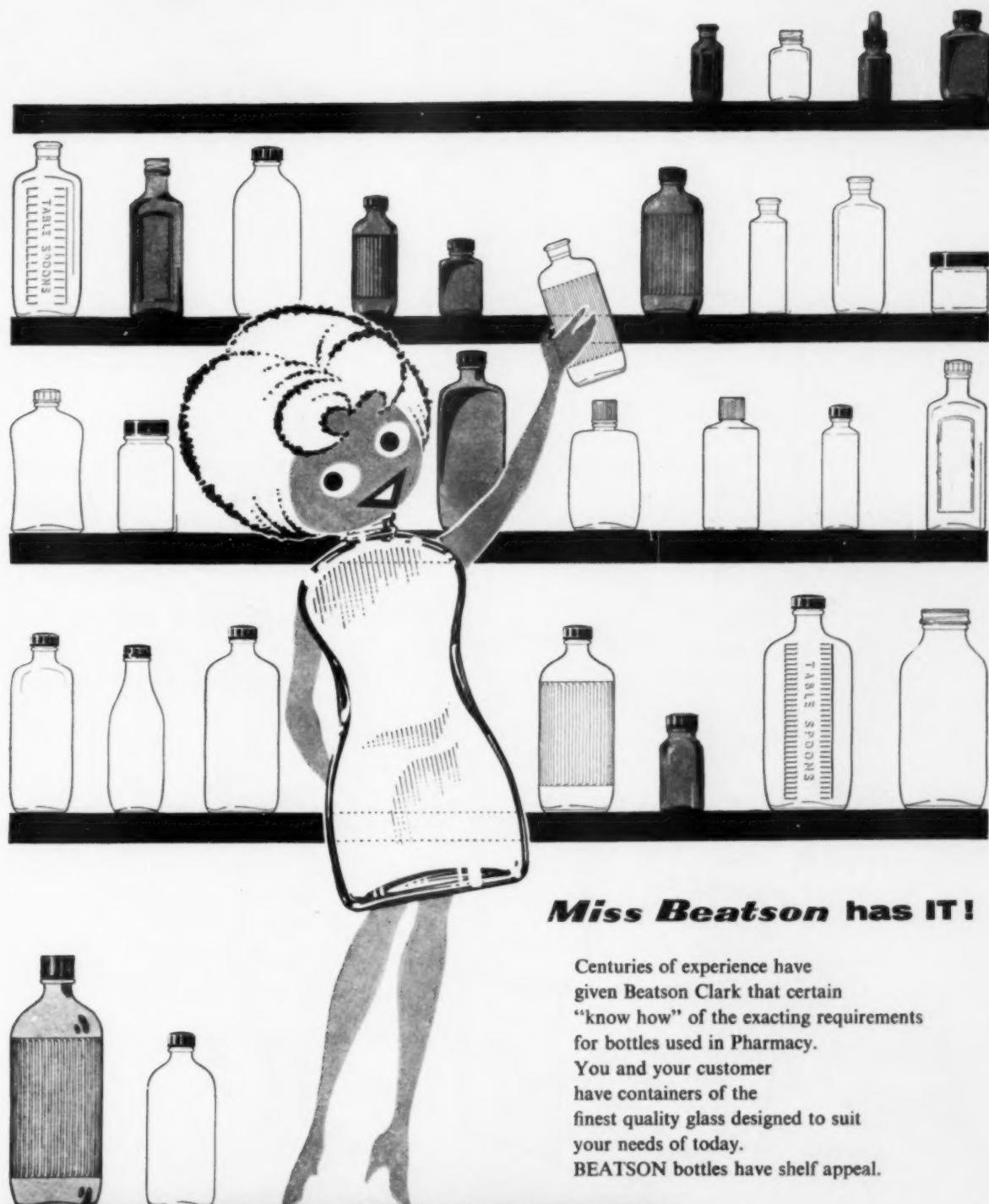
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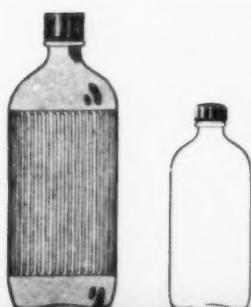
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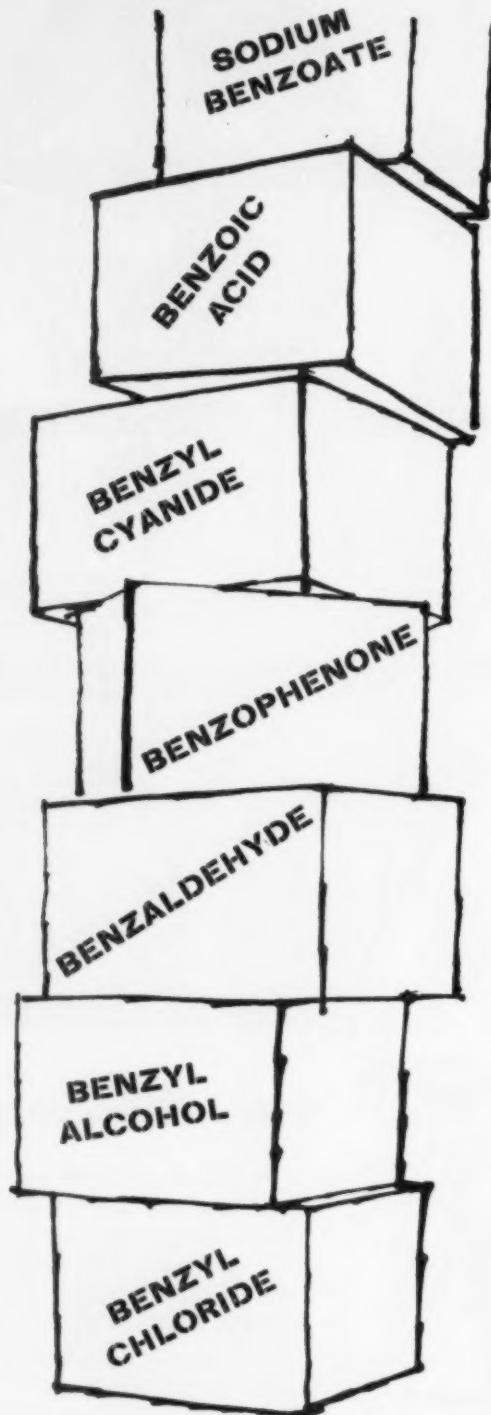
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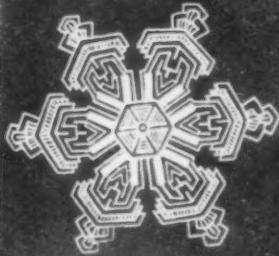
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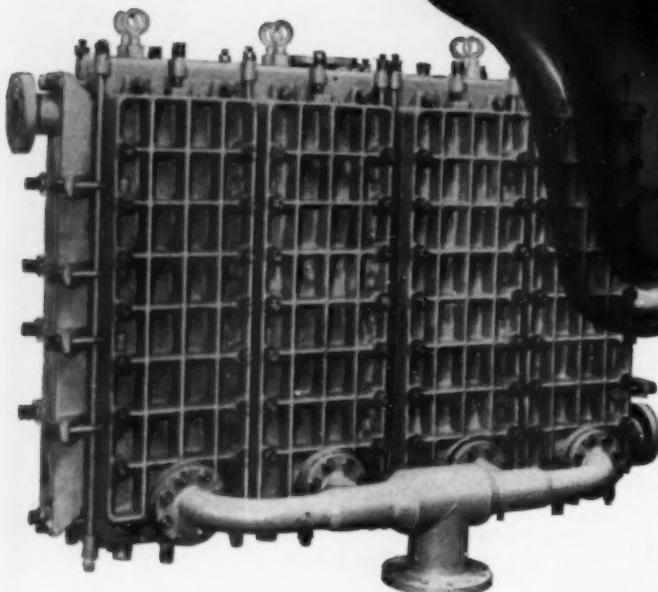
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A21

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Manufacturing Chemist—December, 1961

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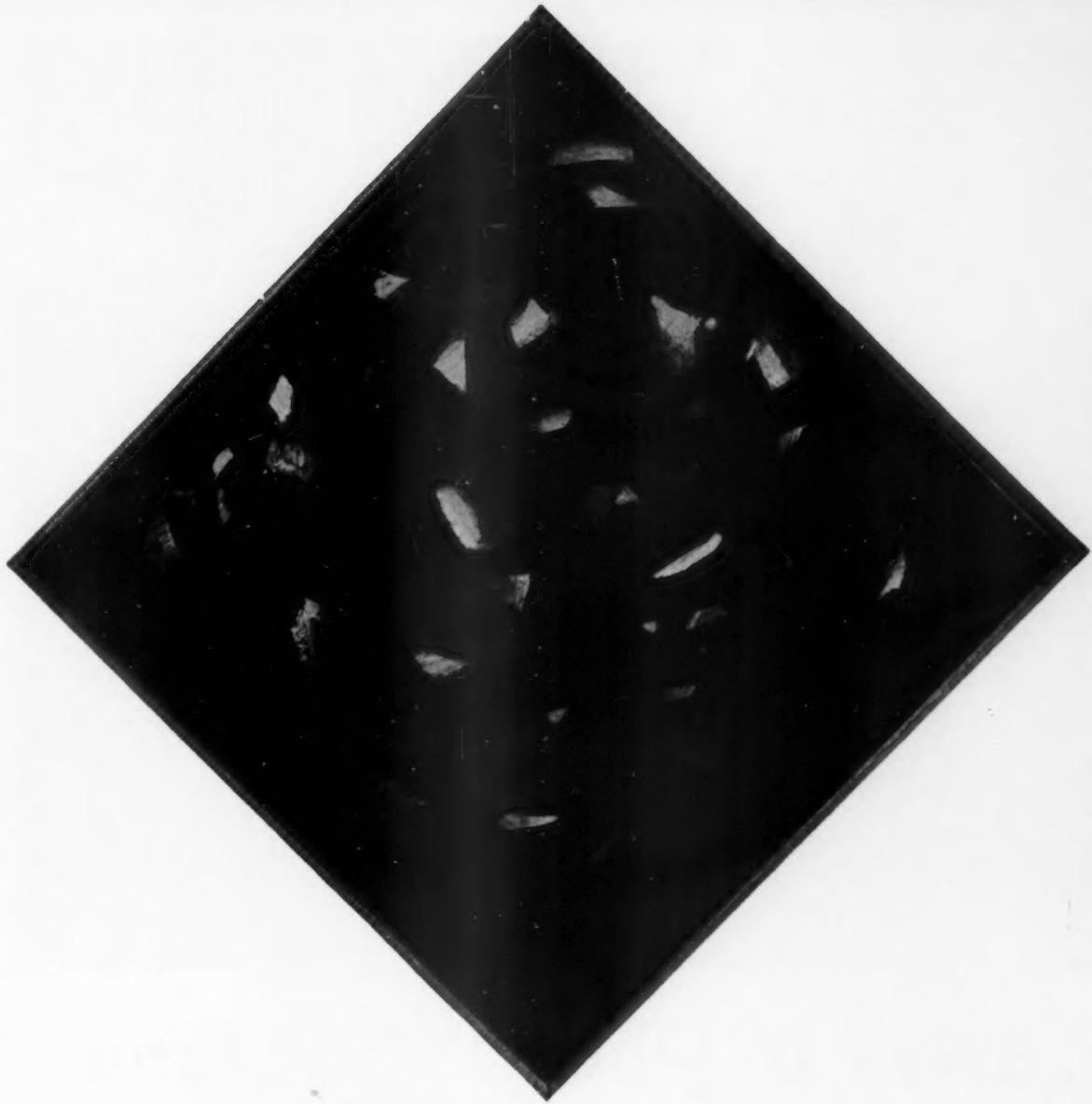
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'TREE OF LIFE'
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There's Methcol in this madness

Most paint and ink manufacturers get their bulk supplies of solvents from one of the six Methcol Depots—Hammersmith, Dagenham, Birmingham, Manchester, Hull and Glasgow.



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away in PLENTY of time

The first of five similar Plenty paddle mixers and 2,300 gallon tanks supplied to Garton Sons & Co. Ltd., Battersea.

The special winch at the side draws the paddles clear of the starch slurry which the paddles keep in suspension, and also allows them to mix at the correct height however much liquid there is in the tank.

A typical job by Plenty's Plant Department—which designs, manufactures, and installs, complete plant for the manufacture of biscuits and animal foods, for the processing and treating of resin and hardener used in the manufacture of spun resin pipes, bulk fat mixing, handling and storage plants, etc., etc.

* Plenty's prompt delivery has resulted in repeat orders for chemical plant from Garton Sons & Co. Ltd.

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TELEX 84110

This truck can reach to a height of 10ft. carrying a maximum load of 2,500lb., in aisles only 6ft. wide. It is made by Lansing Bagnall, the largest and most experienced manufacturers of materials-handling machinery in Europe; machinery that can cut the cost, and time, of any handling operation—in all manufacturing, distributive and extractive industries.

Brilliant Features Lansing Bagnall's FRES 2 reach truck, with its extension/retraction design, allows it to stack at right-angles in aisles only 6ft. wide. With the masts retracted the load is carried between the wheelbase—giving excellent stability, and safety for the load and operator.

Low Operating Cost The FRES 2 works a full shift on one battery recharge, at a cost of 1/6d. Batteries are recharged simply by plugging into

IN 6FT AISLES THIS TRUCK CAN LIFT 2500 LB 10 FT!

the nearest power point of standard AC mains supply. For continuous shift-working, batteries can be changed over by one man in a few minutes.

Simple Operation All controls are within finger-tip reach. One-hand steering leaves the other hand free for control of speed or lifting, lowering and reaching operations, and permits rapid manoeuvring with maximum comfort and safety for the operator at all times.

Instant Accessibility The drive and charge units are completely exposed for maintenance by opening a heavy-plate rear door. The battery is also readily accessible for inspection, and topping-up can be completed in a few seconds.

After-Sales Service Lansing Bagnall offer the most efficient and comprehensive after-sales service in the industry—14 regional depots throughout the country with over 40 service vans on call 24 hours every day throughout the whole life of every truck.

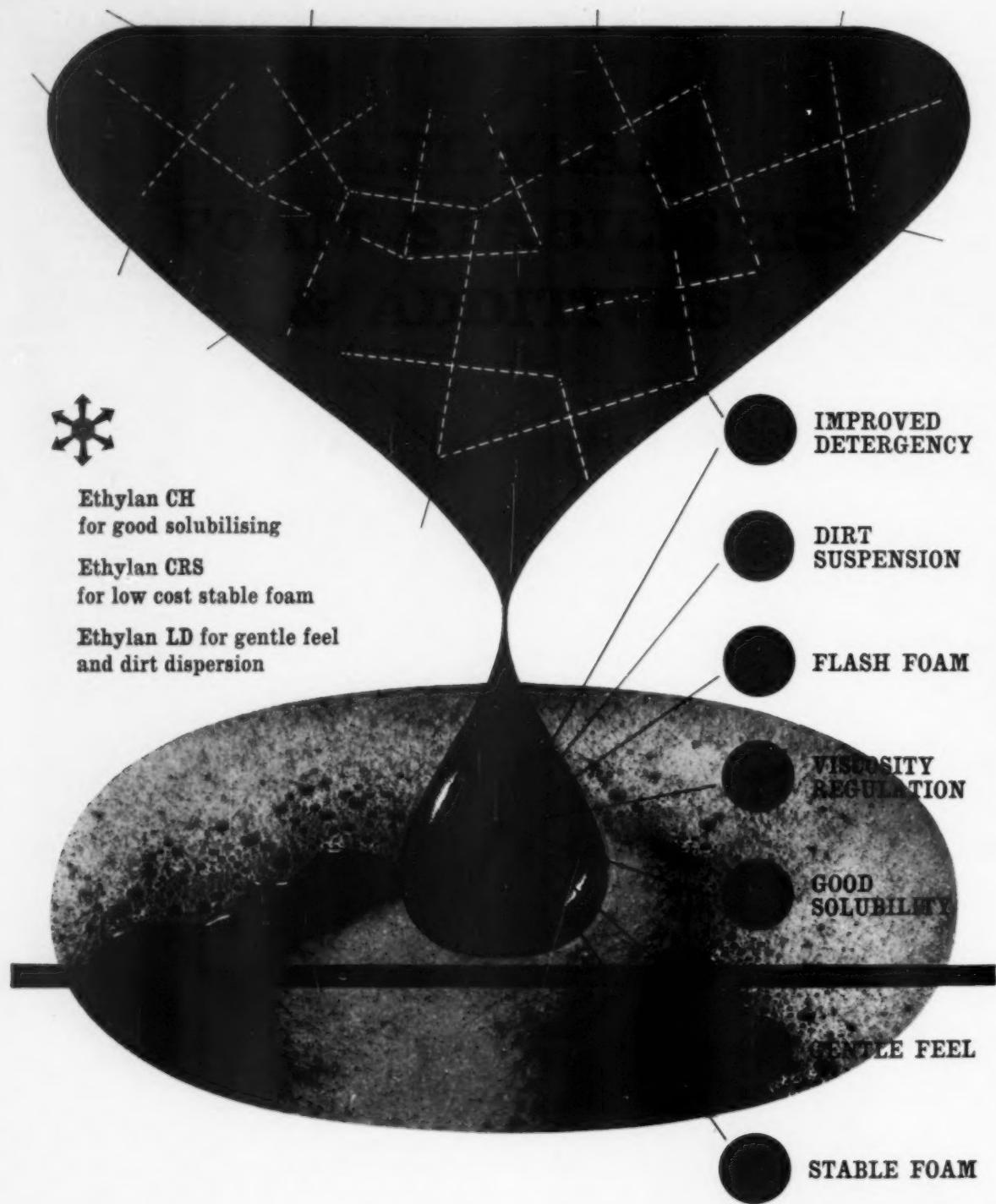


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A28

December, 1961—Manufacturing Chemist

new! new!

'GenKlene'

COLD CLEANING SOLVENT

Already established as Britain's largest manufacturer of chlorinated solvents, I.C.I. announces the addition to its range of a new, safer, non-inflammable, cold cleaning solvent — '**GenKlene**'.

Intended to replace inflammable or more toxic solvents, '**GenKlene**' is particularly recommended for:

- in situ* cleaning, e.g., electrical machinery, office and printing equipment
- production and maintenance cleaning, including intricate or delicate mechanisms

'**GenKlene**' has advantages in many other applications, e.g., adhesives, cutting fluids, and for textile spotting.

Find out more about '**GenKlene**' — better still, try it yourself.

Samples and informative literature are available on request.

Write to:

IMPERIAL CHEMICAL INDUSTRIES LIMITED,
LONDON, S.W.1

'**GenKlene**' is a registered trade mark of IMPERIAL CHEMICAL INDUSTRIES LTD.

Manufacturing Chemist—December, 1961



GC. 20

they're **NEW** to Britain!



CAPTOCAP

TAMPERPROOF SNAP-CAPS

REGD.

Prominent pharmaceutical and food manufacturers in U.S.A., Canada and many other countries are already using these caps in very large quantities.

British manufacturers will find the following advantages of special interest:

- The cap when fitted becomes a part of the container. It cannot be opened without showing signs of interference.
- The cap is simple to open — just tear off the removable strip by pulling the lug.
- The cap is captive, attached by a hinge to the clamping ring. It snaps shut providing a perfect closure throughout the life of container.
- The cap is suitable for all types of glass containers — bottles, jars and 'Trident' tubular vials.
- The cap may be used for pharmaceutical products, foods, soft drinks and for many other purposes.
- The cap is made of polythene. It is hygienic, non-corrosive, impermeable and unbreakable. Supplied in natural or coloured polythene, embossed if desired.
- Neck rings for bottle to accommodate the caps can be made at low cost to fit existing bottle moulds.
- Prices are competitive with normal capping and sealing processes.

We are the manufacturers of CAPTOCAP Tamper-proof Snap-caps and the Sole Licensees for their use with glass containers in Great Britain. Write for our illustrated leaflet.

JOHNSEN & JORGENSEN LIMITED
30 ST. BRIDE STREET, LONDON, E.C.4

Tel: LUDgate Circus 0701 (8 lines)

A30

FITTING. CAPTOCAP Tamperproof Snap-caps are easy to fit by hand operated, semi-automatic or fully automatic machines. Existing capping machines can be adapted in some cases. We shall be pleased to advise manufacturers about their existing plant, or supply information regarding special machines.

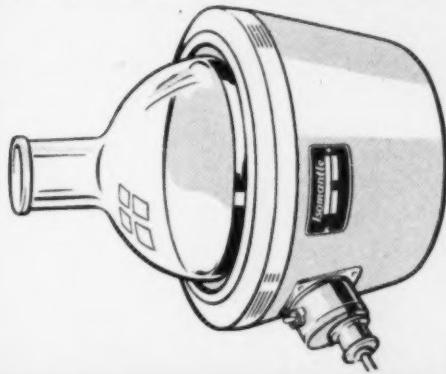
December, 1961—**Manufacturing Chemist**



Extraction Units in the laboratory

The Laboratories of this large Textile Organisation are using many dozens of Isopad Extraction Units as important tools in their research and development. These Units are also available in the special design for flame-proof areas. Full details of the large range of Isomantles for Laboratories are available in the latest Catalogue.

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heating problem.*



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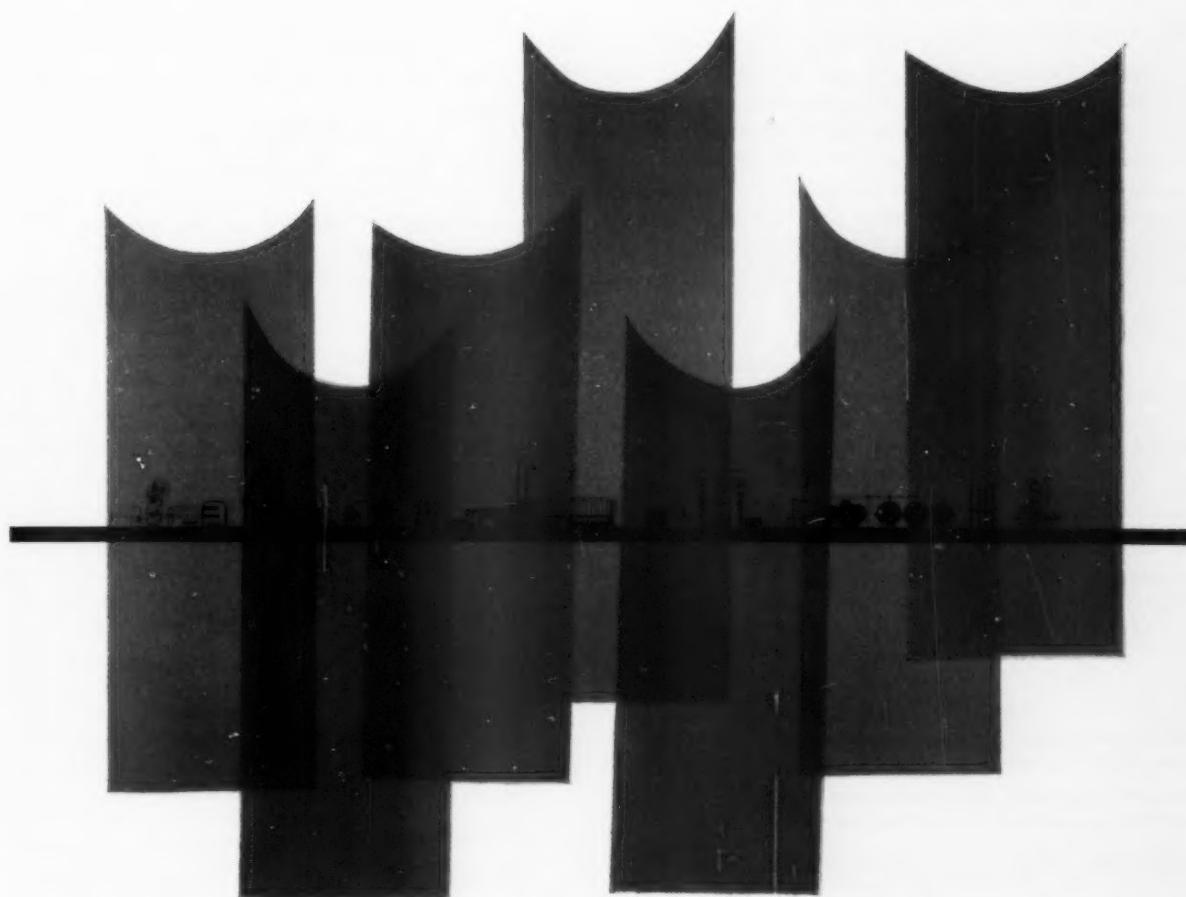
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Index of Du Pont Industrial Chemicals



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GENEVA, SWITZERLAND



BETTER THINGS FOR BETTER LIVING . . . *through Chemistry*

DU PONT CHEMICALS FOR EUROPE

This index is a selection of chemicals and allied products available to manufacturers in Europe. They are made by the Electrochemicals Department and the Industrial & Biochemicals Department of the Du Pont Company. Included in this list is a number of specialty chemicals with new and interesting uses.

Since it was founded 160 years ago in Wilmington, Delaware, U. S. A., the Du Pont Company has, by insisting on rigorous standards of quality and service, grown to become the largest chemical company in the world. Through its distributors in Europe and international sales headquarters in Geneva, Du Pont can provide prompt delivery of chemicals of the highest quality. An increasing number of these products are available in bulk, and from local stocks. Detailed technical assistance on uses and handling is available to customers.

For information on any of these chemicals, please complete the coupon at the end of this index.

ADIPIC ACID - $(\text{CH}_2)_4(\text{COOH})_2$: White crystalline solid; M.P. 152° C.; soluble in alcohol; slightly soluble in water. USE : In manufacture of plasticizers and polyester resins; in organic synthesis; as an edible food acid. CONTAINERS : 50lb. paper bags.

ALUMINUM COMPLEX 101 - TECHNICAL : A Werner type aluminium complex in isopropanol. USE : As a water repellent and sizing treatment for paper, textiles and other materials; for treatment of leather, masonry and other negatively charged surfaces; for insolubilizing various water soluble or swellable coatings. CONTAINERS : 6½-gal. carboys.

AMIDES - See DMAC - Dimethylacetamide ; DMF - Dimethylformamide ; Formamide.

AMINES - See Amine 248 ; Diethylamine ; Dimethylamine ; Hexamethylenetetramine ; Monomethylamine ; Trimethylamine.

AMINE 248 : Amber colored, non-volatile amine slurry with bis-(hexamethylene) triamine and its homologues as principal components. Density is 0.9930 at 25° C. 60% distills between 125-245° C. at 35 mm. pressure. USE : Polyamide resins, curing agent for epoxy resins, water treatment and corrosion inhibitor formulations and absorbing medium for acid gases. CONTAINERS : 55-gal. drums.

AMMONIUM SULFAMATE $\text{NH}_4\text{SO}_3\text{NH}_2$: White, crystalline, hygroscopic solid; extremely soluble in water; moderately soluble in glycerin, glycol and formamide. USE : For retarding flame in textiles and paper products (see "CM" Flame Retardant and "X-12" Flame Retardant); in electroplating solutions. CONTAINERS : 50lb. fiber drums, 100lb. paper bags.

ANISOLE-TECHNICAL (PHENYL METHYL ETHER) - $\text{C}_6\text{H}_5\text{OCH}_3$:

A clear mobile liquid with a light ethereal odor, insoluble in water, soluble in alcohol and ether. B. P. 153.8° C.; F. P. —37.3° C. USE : As a chemical intermediate in alkylation, acylation, halogenation and nitration reactions; as a solvent reaction medium; as a heat transfer medium. Anisole has high heat stability, high flash point, low vapor pressure and low order of toxicity. CONTAINERS : 5- and 55-gal. drums.

"BAYMAL" COLLOIDAL ALUMINA : White powder, consisting of fibrils of boehmite (AlOOH) alumina. USE : Surface modifier for negatively charged substrates, thickening and emulsifying agent, adhesive or binder for inorganic materials.

CALCIUM PROPIONATE : (See "Mycoban" Calcium Propionate.)

CETYL ALCOHOL : (See "Lorol" 24 Cetyl Alcohol.)

"CM" FLAME RETARDANT : Fine, white, granular composition based on ammonium sulfamate and modified to prevent afterglow and to improve penetration. Soluble in water; insoluble in the common dry cleaning solvents. (See Ammonium Sulfamate and "X-12" Flame Retardant.) USE : In flame retardant treatment of fabrics, paper, paper products and other cellulosic materials. CONTAINERS : 50lb. fiber drums, 100lb. paper bags.

CYCLOHEXANOL : (See "Hexalin" Cyclohexanol.)

CYCLOHEXANONE : (See "Hytrol" O Cyclohexanone.)

DECANOL : (See "Lorol" 22 n-Decanol.)

December, 1961—Manufacturing Chemist

DU PONT INDEX OF INDUSTRIAL CHEMICALS

1,4 DICHLOROBUTENE-2 CICH₂CH = CHCH₂Cl : Available as trans isomer in 95-98% purity. Vesicant colorless liquid of density 1.18-25/4°C.; atmospheric boiling point 158°C.; soluble in hydrocarbons. USE : Intermediate in manufacture of unsaturated difunctional compounds, electroplating chemicals, biologically active compounds, and textile treating compounds. CONTAINERS : 55-gal. drums.

DIETHYLAMINE-TECHNICAL-(CH₂)₂NH : Colorless liquid ; B. P. 55.4°C. ; Sp. Gr. 0.706 ; miscible with water and most organic solvents. USE : In the synthesis of rubber chemicals, pharmaceuticals, pesticides, fungicides, herbicides, corrosion inhibitors, textile softeners, wetting agents, and emulsifiers. CONTAINERS : 5- and 55-gal. drums.

DIGLYCOLIC ACID - O (CH₂COOH)₂ : White crystalline solid ; M. P. (pure) 148°C.; soluble in water and alcohol ; pH of 10% aqueous solution 1.4. Forms a nonhygroscopic monohydrate at relative humidities above 72% at 25°C. USE : In manufacture of resins and plasticizers ; in organic synthesis ; sequestering agent ; emulsion breaker in petroleum, and coagulant in rubber and plastics. CONTAINERS : 50lb. paper bags.

DMAC-DIMETHYLACETAMIDE-TECHNICAL - CH₃CON(CH₃)₂ : Colorless liquid ; B. P. 165.5°C. ; F. P. —20°C. ; Sp. Gr. 0.945 ; miscible with water and common organic solvents. USE: As a solvent for polyacrylonitrile, vinyl resins, cellulose derivatives, styrenes, linear polyesters and paint removers. As a catalyst and solvent in elimination, halogenation, cyclization, alkylation, interesterification, phthaloylation reactions and others. CONTAINERS : 5- and 55-gal. drums.

DMA-DIMETHYLAMINE AQUEOUS SOLUTION - TECHNICAL - (CH₃)₂NH : Colorless liquid. USE : Intermediate in the manufacture of rubber accelerators and quaternary compounds ; in manufacture of pharmaceutical intermediates, fungicides and herbicides ; as a dehairing agent in leather processing ; in manufacture of solvents and rocket fuels. CONTAINERS : 55-gal. drums, tank cars and tank trucks.

DMF-DIMETHYL FORMAMIDE-TECHNICAL-HCON(CH₃)₂ : Colorless liquid ; B. P. 153°C. ; F. P. —61°C. ; Sp. Gr. 0.953 ; miscible with water and common organic solvents. USE : As a solvent for vinyl resins in lacquers, films and printing inks, for pigments, dyes and inorganic salts. As a catalyst and solvent in many types of organic reactions such as halogenation, alkylation, elimination, cyclization and many others. As a reaction medium for dyes ; as a selective refining solvent for acetylene, acid gases and petroleum constituents. CONTAINERS : 5- and 55-gal. drums, tank trucks, tank cars.

DIMETHYL SULFATE (METHYL SULFATE)-(CH₃)₂SO₄ : Water-white liquid ; B. P. 188.8°C. ; F. P. —31.8°C. ; Sp. Gr. (15.6°/15.6°C.) 1.332. USE : As a methylating agent in making intermediates, dyes and synthetic drugs. CONTAINERS : 55-gal. drums.

FATTY ALCOHOLS : (See "Lorol" Fatty Alcohols.)

FLAME RETARDANT : (See Ammonium Sulfamate, "CM" Flame Retardant and "X-12" Flame Retardant.)

FORMAMIDE - TECHNICAL - HCONH₂ : Colorless, viscous hygroscopic liquid ; B. P. 210°C. ; F. P. 2.5°C. USE : Excep-

tionally good solvent ; softener (e.g., in paper, glues) ; chemical intermediate. CONTAINERS : 55-gal. drums.

"G-942" TANNING AGENT : An aqueous solution of the partial sodium salt of a polymeric carboxylic acid. USE : In processing lightweight skins for the production of high grade suede and grain leathers. Excellent properties for white clear through leathers. Possesses high skin-plumping ability. CONTAINERS : 500lb. drums.

GLYCOLIC ACID : (See Hydroxyacetic Acid.)

"HEXALIN" CYCLOHEXANOL - C₆H₁₂OH : Colorless liquid ; F. P. (pure) 25.2°C. (usually shipped with 2.25% methanol as anti-freeze) ; B. P. (pure) 161.1°C. USE : Solvent in lacquers, shellacs and varnishes ; homogenizer and stabilizer in soap, drycleaning and textile industries ; intermediate for chemicals, plasticizers, lubricating oil additives. CONTAINERS : 55-gal. drums.

HEXAMETHYLENETETRAMINE (UROTROPIN, HEXAMINE) - (CH₂)₆N₄ : A white powder or granular solid ; soluble in water, chloroform and alcohol. At 263°C. it sublimes without melting ; on contact with fire it readily ignites and burns with a smokeless flame. USE : In manufacture of phenolic molding resins, cork products, rubber accelerators and pharmaceuticals ; in chemical synthesis ; for hardening casein, glue, and other proteins. CONTAINERS : 50lb. multiwall bags ; 150 and 200lb. drums.

Technical Grade : Granular and powder forms. CONTAINS 0.3% max. ash and 0.3% max. moisture.

Technical Grade FF : Granular FF contains 0.3% - 0.7% anticaking agent ; 0.7 % max. ash and 0.3 % max. moisture. Powder FF contains 2.25 - 3.75% anticaking agent ; 3.5% max. ash and 0.3% max. moisture.

HYDROXYACETIC ACID (GLYCOLIC ACID) - TECHNICAL GRADE 70% - HOCH₂COOH : Light straw colored liquid containing approximately 70% hydroxyacetic acid with traces of other organic acids ; F. P. 10°C. USE : In dyeing and tanning of leather ; dyeing of textiles ; manufacture of cleaning compounds ; adhesives ; adhesives emulsifier ; neutralizing agent ; pH control ; sequestering agent ; bright-dipping of copper, electro-polishing of stainless steel, and electroplating. CONTAINERS : 55-gal. lined steel drums.

"HYTROL" O CYCLOHEXANONE - C₆H₁₀O : Colorless liquid ; B. P. 156.7°C. ; F. P. —47°C. USE : As a solvent in the textile, paint and varnish industries, especially for vinyls ; as a chemical intermediate ; lube oil additive. CONTAINERS : 55-gal. drums.

LAURYL ALCOHOL : (See "Lorol" 5 and 7 Fatty Alcohol Technical, below.)

"LIGNASAN" X FUNGICIDE : A blue powder containing ethyl mercury phosphate. USE : In the pulp and paper industry for slime control and pulp preservation ; as a preservative for paper sizes. CONTAINERS : 125lb. drums.

"LOROL" FATTY ALCOHOLS : A group of straight chain (normal) even-numbered-carbon alcohols ranging from C-8 (octyl) to C-18 (stearyl). CONTAINERS : 55-gal. drums or 50lb. or 140lb. drums or bags.

DU PONT INDEX OF INDUSTRIAL CHEMICALS

"LOROL" 5 FATTY ALCOHOL TECHNICAL : Mixture of straight chain (normal) even-numbered-carbon alcohols (C-10 to C-18) with lauryl alcohol predominating.

"LOROL" 7 FATTY ALCOHOL TECHNICAL : Similar to "Lorol" 5 except that it contains a higher percentage of stearyl alcohol.

"LOROL" 9 FATTY ALCOHOL TECHNICAL : About 70% lauryl alcohol.

"LOROL" 11 FATTY ALCOHOL TECHNICAL : About 80% lauryl and 20% myristyl alcohol.

"LOROL" 20 FATTY ALCOHOL TECHNICAL : Essentially normal octyl alcohol.

"LOROL" 22 FATTY ALCOHOL TECHNICAL : Essentially normal decyl alcohol.

"LOROL" 24 CETYL ALCOHOL-NATIONAL FORMULARY GRADE: Cetyl alcohol.

"LOROL" 28 INDUSTRIAL FATTY ALCOHOL : Technical grade stearyl alcohol.

"LOROL" 28 STEARYL ALCOHOL - U. S. P. GRADE : Stearyl alcohol.

"LUDOX" COLLOIDAL SILICA - TECHNICAL : A series of aqueous colloidal sols containing approximately 15 or 30% SiO_2 . USES : For anti-slip treatment of fabrics and paper, modifications of latex foams and films, for increasing the slip resistance of floor waxes, binder for inorganic fibrous materials. CONTAINERS : 55-gal. drums.

METHYL FORMATE - TECHNICAL (97%) - HCOOCH_3 : Colorless, mobile, volatile liquid ; B. P. 31.8° C. USE : As an ingredient in fumigants ; as a solvent ; in manufacture of formates, sulfa drugs and organic chemicals. CONTAINERS : 55-gal. drums.

MMA - MONOMETHYLAMINE - AQUEOUS SOLUTION - CH_3NH_2 : Colorless liquid. USE : In the manufacture of pharmaceutical intermediates for the xanthine alkaloids, theophylline, caffeine, the sympathomimetic drugs such as ephedrine, and the analgesic meperidine ; in manufacture of surface active agents ; photographic developers ; dyes ; in manufacture of soil fumigants and fungicides for agriculture. CONTAINERS : 55-gal. drums.

"MYCOBAN" CALCIUM PROPIONATE - $\text{Ca}(\text{CH}_2\text{CH}_2\text{COO})_2$: White powder. USE : Inhibitor of mold and certain other microorganisms in baked goods, pasteurized process and blended cheeses and cheese foods packaged as slices and cuts for consumer distribution, and tobaccos. CONTAINERS : 250lb. drums.

"MYCOBAN" SODIUM PROPIONATE - $\text{CH}_3\text{CH}_2\text{COONa}$: White powder. USE : Inhibitor of mold and certain other microorganisms in baked goods, pasteurized process and blended cheeses and cheese foods packaged as slices and cuts for consumer distribution, and tobaccos. CONTAINERS : 60lb. cartons (six 10lb. packages), 250lb. fiber drums.

OCTANOL : (See "LOROL" 20 n-Octyl alcohol.)

POTASSIUM SILICATE - SOLUTION - ELECTRONICS 200 -

TECHNICAL : Filtered, water white solution having a SiO_2 : K_2O weight ratio of 2.07 ; especially low in heavy metals content. USE : In coating cathode ray tubes with phosphors, in other uses for potassium silicate where a product of superior clarity and purity is required. CONTAINERS : 55-gal. polyethylene lined drums.

"QUILON" CHROME COMPLEX : A Werner type chromium complex in isopropanol. USE : As a water repellent and sizing treatment of paper and other cellulosic materials ; for treatment of felt hats, leather, wool fabrics, hydrophobic fibers, and siliceous and other negatively charged surfaces ; as an anti-blocking or release agent ; for insolubilizing various water soluble or swellable coatings. CONTAINERS : 6½-gal. carboys, 55-gal. drums.

SODIUM PROPIONATE : (See "Mycoban" Sodium Propionate.)

STEARYL ALCOHOL : (See "Lorol" 28 Stearyl Alcohol.)

SULFAMIC ACID - TECHNICAL - CRYSTAL AND GRANULAR GRADES, HSO_3NH_2 : White crystalline or granular solid, soluble in water ; aqueous solutions approach the common mineral acids in acidity ; all common salts highly water soluble. USE : For removing scales and deposits from boilers, heat exchangers, condensers, evaporators, jacketed vessels, etc. ; Felt shower water pH adjustment to retard felt fillup ; chlorine stabilization and pH reduction agent for swimming pools ; oil well descaling agent ; as an ingredient in household cleaning formulations ; in nitrite removal in azo dye manufacture and piece dyeing of textiles and leather ; in sulfation of alcohols ; as a catalyst for urea-formaldehyde resins ; as the electrolyte in plating baths. CONTAINERS : 400, 425lb. fiber drums.

THIODIPROPIONATE ANTIOXIDANT : White, low melting solid consisting of mixed esters of thiodipropionic acid ; 70% lauryl ester, 20% myristyl ester, and 10% cetyl ester. Melting point 30-33° C., specific gravity of solid is 0.975 at 25° C. ; specific gravity of liquid is 0.919 at 40° C. USE : Antioxidant for olefin polymers. Chemical preservative in edible fats and oils. CONTAINERS : 30-gal. drums with 220lb. net product.

TRIMETHYLAMINE - AQUEOUS SOLUTION - TECHNICAL - $\text{N}(\text{CH}_3)_3$: Colorless liquid. USE : Intermediate for choline salts (animal feed supplement) and quaternary ammonium salts ; in organic syntheses ; in manufacture of ion exchange resins and pharmaceutical intermediates. CONTAINERS : 55-gal. drums.

"VOLAN" BONDING AGENT - METHACRYLATO CHROMIC CHLORIDE : A Werner type chromium complex in isopropanol. USE : As a bonding agent applied to glass fibers used in reinforced plastic laminates to improve the adhesion between glass and resin, especially under moist conditions ; also to improve adhesive bond between other hydrophilic surfaces such as paper and wood and polymeric coatings or impregnants. CONTAINERS : 6½-gal. carboys and 55-gal. drums.

"X-12" FLAME RETARDANT : White crystalline material, completely soluble in hot water. USE : One-step, renewable-type flame retardant treatment for use on cellulosic materials. CONTAINERS : 50lb. fiber drums, 100lb. paper bags.

DU PONT INDEX OF INDUSTRIAL CHEMICALS

CERAMIC PRODUCTS

Ceramic Colors

GLASS ENAMELS : A series of finely ground fluxes, intimately blended with ceramic pigments. Full range of colors available in paste (mixture of enamel with air-drying or thermofluid squeegee medium) or dry form. Different grades give characteristics of acid resistance, alkali resistance, sulfide resistance, or low lead release to meet requirements for various uses. USE : For fired-on labels and decorations on glassware, tumblers, milk bottles, beverage bottles, glass containers, illuminating ware, architectural glass and signs. CONTAINERS : 100lb. steel pails ; 200lb. steel drums.

Also available are enamels for aluminium, gold-based glazes and stains, overglaze colors, as well as mediums and thinners which are specially compounded for the paste ceramic colors.

Conductive Silver Preparations

CONDUCTIVE COATING MATERIALS : Specially compounded materials containing silver powder in a suitable vehicle, with or without ceramic flux. Types for air-drying, baking at low temperatures and firing at elevated temperatures. USE : To produce capacitor or electrodes, ceramic to metal solder seals, electrical shields, surfaces of high conductivity on non-conductive materials ; as a base for electroplating on ceramic and nonceramic surfaces. CONTAINERS : Paste, qt. and gal. cans ; liquid, pt. and gal. bottles.

Pigments

A series of finely ground, calcined oxide pigments available as body stains, glaze stains and underglaze stains for use in the ceramic industry and for coloring vitreous enamels. Having good color stability to light and temperature, these pigments can also be used in the plastics, paper and textile industries where special stability is desirable. CONTAINERS : 25, 50, 100 and 200lb. drums.

Precious Metal Compositions

DECORATIVE : Formulations of gold, platinum or palladium in solution or paste form, suitable for decoration of chinaware and other ceramic surfaces.

ELECTRONIC : Gold, platinum or palladium compositions for use as conductive cements, for application on semiconductors (transistors and diodes), special capacitors and printed circuits.

UNITS : Troy ounces (31.1 grams).

Manufacturing Chemist—December, 1961

CYANIDE PRODUCTS

POTASSIUM CYANIDE 98% - KCN : A white, granular, poisonous chemical : contains 98% min. potassium cyanide. USE : In high speed copper and silver plating processes, with sodium cyanide for cyanide nitriding. CONTAINERS : 100lb. drums.

SODIUM CYANIDE 97% - NaCN : A white solid fused in 1-oz. briquettes ("Cyanobrik" sodium cyanide) and granular form ("Cyanogran" M sodium cyanide). Sodium cyanide content 97% min. USE : Heat treating of steel in electroplating ; in cleaning of metal, including neutralizing after pickling ; in fumigation ; dehauling of hides ; for manufacture of indigo, dye intermediates and other chemical compounds ; in the extraction of gold, silver, zinc and lead from ores. CONTAINERS : 100lb. drums.

FURAN PRODUCTS

FURAN (FURFURANE) - (CH₂)₂O : A highly volatile, colorless liquid, miscible with most organic solvents ; slightly soluble in water. USE : Furan is highly reactive by either substitution or addition. Lends itself to pharmaceutical and industrial syntheses. CONTAINERS : 400lb. drums.

TETRAHYDROFURAN (TETRAMETHYLENE OXIDE, THF) - (CH₂)₂O : A clear, colorless liquid with ether-like odor ; readily miscible with organic solvents and water. USE : Excellent solvent for high molecular weight polyvinyl chloride resins and vinylidene chloride copolymers ; for coatings, films, adhesives, printing inks, etc. ; unique reaction solvent for carrying out Grignard, sodium acetylides, and reduction reactions, including hydrogenations ; component in paint remover and cold cleaner formulations ; chemical syntheses ; and extraction processes. CONTAINERS : 400lb. drums.

PEROXYGEN PRODUCTS

"OXONE" MONOPERSULFATE COMPOUND : An acidic, white, granular, free-flowing solid containing the active ingredient potassium peroxymonosulfate ; readily soluble in water ; 1% solution has pH of 2-3. Minimum active oxygen content 4.5%. Strong oxidizing agent. USE : For manufacture of dry laundry bleaches, detergent-bleach washing compounds, scouring powders, plastic dishware cleaners and metal cleaners ; preparation of hair wave neutralizers and pharmaceuticals ; general oxidizing reactions. CONTAINERS : 100lb. bags.

DU PONT INDEX OF INDUSTRIAL CHEMICALS

POLYMER PRODUCTS

"ELVACET" POLYVINYL ACETATE EMULSIONS: A series of viscous, milkwhite water dispersions of polyvinyl acetate or of copolymers of polyvinyl acetate. USE: Paint vehicles; adhesive base materials for cellophane, wood, paper, cloth, ceramics, leather, cork and metals; binders for paper pulp, sawdust, leather scrap, sand, clay, nonwoven fiber, pigments and cement; textile finishes and sizes; paper coatings for greaseproofing and heat-sealing. CONTAINERS: 45lb. pails; 500lb. drums.

"ELVACET" POLYVINYL ACETATE SOLUTION ("ELVACET" 60-05): Colorless, odorless, polyvinyl acetate available as a 60% solution in methanol. USE: Base for adhesives and binders, vehicle for metallic pigments; protective coatings on metal; heat-seal applications; greaseproofings; stiffening and permanent sizing. CONTAINERS: 38lb. pails, 400lb. drums.

"ELVANOL" POLYVINYL ALCOHOL: Water-soluble synthetic resin; available in 8 grades covering various degrees of hydrolysis in three viscosities (high, medium, and low). USE: Textile warp size; size for nylon and rayon knitting yarns; pigmented paper coating binder; greaseproofing paper; paper size; top size on paperboard for high gloss printing; component in ELVASEIVE process; base material for wet strength paper laminating adhesives, nonblocking, remoistenable adhesives; adhesives and binders for leather, cloth, nonwoven fabrics and paper; pigment binder; temporary protective coatings; molded products; emulsifying agents; emulsion stabilizer and thickener; photo-sensitive films; chemical intermediate. CONTAINERS: 50lb. multiwall bags; 100lb. drums.

"ELVAX" VINYL RESINS: Highly wax-compatible, amorphous polymers. Supplied in several basic compositions for hot-melt adhesive and coating formulation, the other for toughening waxes. Readily soluble in waxes, various low molecular weight resins and rosin esters. USES: As a wax additive, improves toughness, reduces flaking, improves heat-seal bond strength. "Elvax"-wax coatings used for improved wax overwrap and tough, heat-sealable, sheet-waxed cartonboard which retains low moisture vapor transmission, even after creasing. In laminating formulations for paper to paper and paper to cellophane, polyethylene, polystyrene, "Mylar" Polyester Film, or other plastic films, and to metal foils; as a base for hot-melt adhesives; as a low dielectric component in potting compounds. CONTAINERS: 50lb. bags.

"LUCITE" ACRYLIC RESINS: White, granular solid, thermoplastic resins. Used in lacquers and other finishes, for aerosol "snow", coatings for fabrics and hot-melt adhesive compositions, impregnants for leather, modifiers for other resins, e.g. vinyls. CONTAINERS: Various sizes.

METHACRYLATE ESTER MONOMERS: Colorless, volatile liquids, used for the production of polymers with outstanding resistance to deterioration by light and exposure to weather. Also used as raw materials for the preparation of monomeric derivatives. Available: Methyl-, ethyl-, n-butyl- and i-butyl-methacrylate ester. CONTAINERS: 55-gal. drums.

METHACRYLIC ACID: Water-white liquid, used with acrylic monomers in polymerizations to modify end products. CONTAINERS: 55-gal. drums.

"ZYTEL" 61 NYLON RESINS: Light, cream-colored, opalescent 1/8" (3 mm.) cubes. USES: In combination with epoxies and phenolics for binders, adhesives and coatings. Adhesive for wood, textiles, metal and glass. Ingredient in lacquers and other finishes for paper and textiles. Protective coating for thread; textile finish for improved hand, moisture absorption and abrasion resistance; stiffener and binder. Hydrocarbon barrier in fuel cells. Electrical cable insulation, wire enamel.

For further information please complete coupon below.

To Du Pont de Nemours International S. A.,
Industrial Chemicals Advertising,
81 Route de l'Aire,
GENEVE (Switzerland).

Please send details of following chemicals: _____

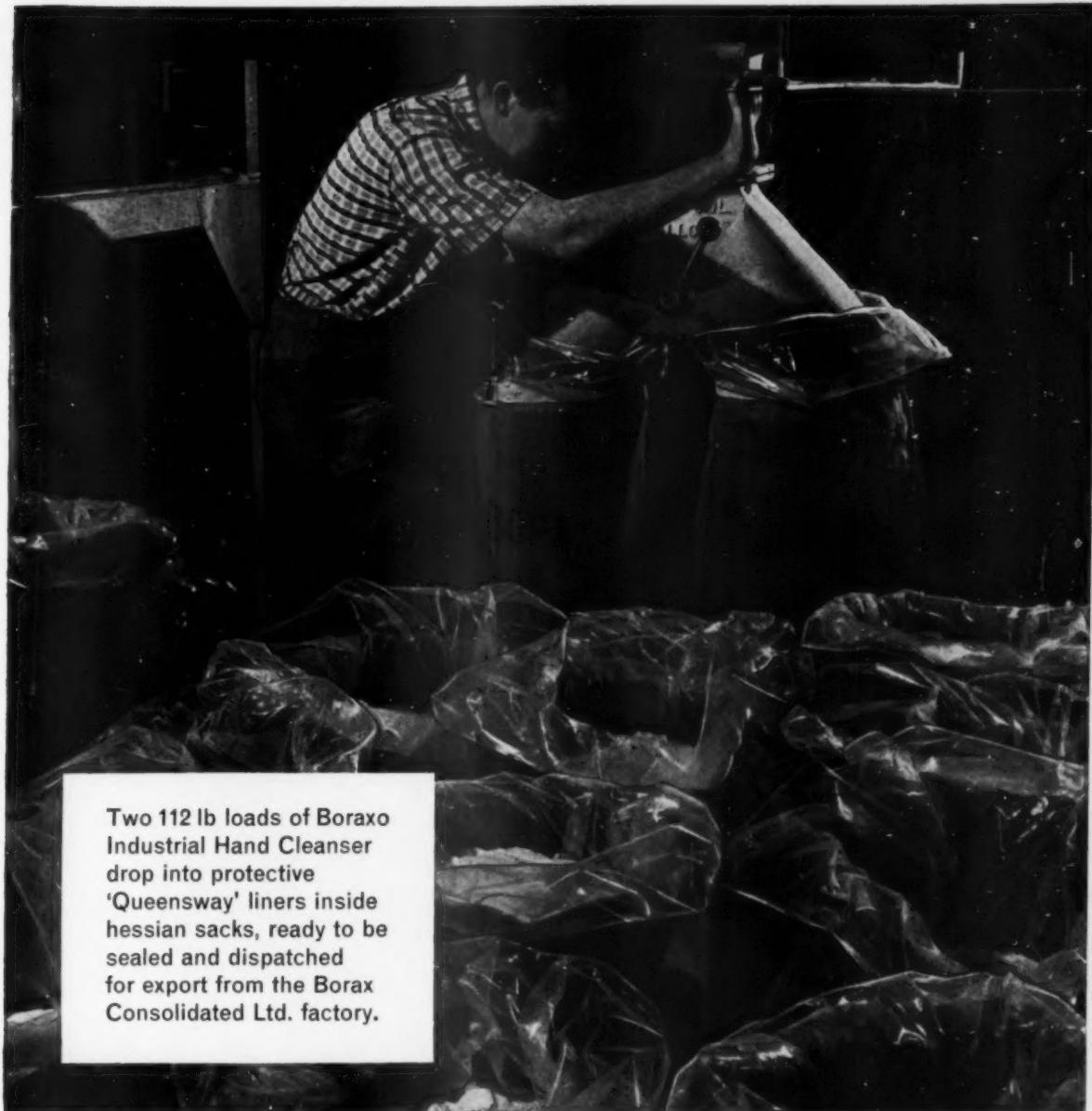
Name _____

Firm _____

Position _____

Address _____

Tel. No. _____



Two 112 lb loads of Boraxo Industrial Hand Cleanser drop into protective 'Queensway' liners inside hessian sacks, ready to be sealed and dispatched for export from the Borax Consolidated Ltd. factory.

'Queensway'

the liner and the service for bulk chemical sales

'Queensway' polythene liners like these are made by British Visqueen Ltd., the recognised authorities on polythene film packaging. They are made from selected film to your exact specifications by experts. They are chemically inert, provide a quick and complete seal against moisture and are tough enough to withstand

long journeys to export markets with only a hessian outer. They are also extremely competitive in price. If you are aiming at large scale bulk sales for your chemicals, whether you pack in drums, cartons or sacks, ring Stevenage 1310 now about 'Queensway' polythene liners.

'Queensway' polythene liners

QW191

FROM BRITISH VISQUEEN LIMITED · SIX HILLS WAY · STEVENAGE · HERTS

Manufacturing Chemist—December, 1961

A39

"IMPOSSIBILITIES" SEDOM AFFECTS STAINLESS STEEL

Difficult fabrications in stainless steel are commonplace at T.R.F. Impossibilities with this versatile metal seldom arise! If you have a plan for any construction in which stainless steel can play a role consult T.R.F. before you even put it onto the drawing board. In your own interests, insist on advice from the T.R.F. design team before you go ahead. They are the people who can speed things up; cut down on your expenditure and avoid your headaches!

Spherical High Pressure Valve in
1" thick Stainless Steel, 5 ft.
in diameter. Fully radio-
graphed welds. Shown
in part construction.



TAYLOR RUSTLESS FITTINGS CO., LTD.

Head Office: Ring Road, Lower Wortley, Leeds, 12.
London Office: 14 Gt. Peter Street, London, S.W.1.

Telephone: Leeds 63-8711/2/3

Telephone: Abbey 1575

why
is **G-11**
(HEXACHLOROPHENONE) *the germicide of choice in
over 2,000 commercial products?*



OUTSTANDING PERFORMANCE

Over 250 scientific publications attest to its usefulness. Controls gram positive and negative bacteria and many fungi that inhabit the skin. You'll find it in over 90% of the country's hospitals; it's in the B.P.C.

Whenever you think of using a germicide, feel free to consult Givaudan who discovered and developed Hexachlorophene.

PROVEN SAFETY

Over ten years of use in soaps, cosmetics, and pharmaceuticals applied from head to foot. Rarely has a germicide been so thoroughly tested.

GIVAUDAN & CO. LTD.
Godstone Road, Whyteleafe, Surrey

Telephone: Upper Warlingham 2241 (5 lines)



VERSATILE FUNGICIDE AND BACTERICIDE FOR INDUSTRY—

Whatever your business, you'll find 'TOPANE' the best germicide you can buy. Outstanding in safety and non-toxicity, 'TOPANE' also fills the bill in efficiency and economy. Consider the low concentrations of 'TOPANE' needed to control the growth of these prevalent fungi and bacteria:

Industry	Species of fungi or bacteria prevalent	% for inhibition of growth	Industry	Species of fungi or bacteria prevalent	% for inhibition of growth
Disinfectants	<i>Aerobacter aerogenes</i>	0.032	Adhesives	<i>Bacillus subtilis</i>	0.016
	<i>Bacillus rubricus</i>	0.004		<i>Aspergillus flavus</i>	0.008
	<i>Escherichia coli</i>	0.032		<i>Paecilomyces varioti</i>	0.008
	<i>Pseudomonas caudata</i>	0.032		<i>Penicillium variabile</i>	0.004
	<i>Staphylococcus aureus</i>	0.032			
	<i>Trichophyton interdigitale</i>	0.008			
Textiles and Ropes			Timber	<i>Ceratocystis pilifera</i>	0.008
				<i>Coniophora cerebella</i>	0.008
				<i>Merulius lacrymans</i>	0.001
	<i>Aspergillus niger</i>	0.004		<i>Polystictus versicolor</i>	0.008
	<i>Chaetomium globosum</i>	0.008			
	<i>Cladosporium herbarum</i>	0.008			
	<i>Memnoniella echinata</i>	0.004			
Foods	<i>Myrothecium verrucaria</i>	0.002	Foods	<i>Alternaria citri</i>	0.008
	<i>Penicillium notatum</i>	0.008		<i>Diplodia natalensis</i>	0.010
				<i>Penicillium italicum</i>	0.016
				<i>Rhizopus nigricans</i>	0.016

'TOPANE' (I.C.I.'s brand of ortho phenylphenol) is soluble in organic solvents, and 'TOPANE' WS (I.C.I.'s brand of sodium ortho phenylphenate) is its water-soluble grade. Both products are lethal to many bacteria, fungal spores, surface mildews, and rots, and can be employed to protect organic matter against most forms of microbiological degradation.

'TOPANE' COMBINES EFFICIENCY WITH OUTSTANDING SAFETY

1. DISINFECTANTS



'Topane' is a powerful weapon against infection. It broadens the killing range of disinfectant formulations. It can kill both Gram-positive and Gram-negative bacteria, and has low affinity for extraneous organic matter and low toxicity to higher life. 'Topane' is not classified as a poison and its high efficiency plus safety-in-handling recommend it in domestic, veterinary and industrial disinfectants.

2. TEXTILES and ROPES



Rotproofed with 'Topane', textiles and ropes stay strong, last longer. Effective and persistent, easy and economical to use, non-toxic and non-irritant, 'Topane' gives excellent protection against rot caused by bacterial and fungal attack to ropes and fishing-nets, canvases, carpets and felts, rubberised or p.v.c.-coated fabrics and textile finishes.

3. ADHESIVES



'Topane'-preserved adhesives are fully protected against bacteria and fungi. Incorporated early in the manufacture of the adhesive, 'Topane' ensures the protection of the finished product even after subsequent reconstitution and use. 'Topane' is ideal for the preservation of adhesives incorporating glue and gelatine, starch, dextrin and cellulose; casein; blood and albumin; and latex.



4. TIMBER

Deadly to wood-destroying fungi but non-toxic to humans, 'Topane'-based formulations are safe and economical for treating wet and dry rot in buildings and boats or for preventing sap-stain in freshly sown timber. Tests carried out on highly resistant fungi show that 'Topane' gives outstanding protection to both soft and hard woods. It may also be used in conjunction with insecticides to give single-treatment timber protection.

5. FOOD STORES



Food stores disinfected with 'Topane' prevent waste and cut losses. Stored food is vulnerable to bacterial and fungal attack; 'Topane' kills food-spoiling bacteria and fungi. Cleaning and disinfecting with 'Topane' helps to keep stored food fresh by eliminating the sources of infection in warehouses, bakeries, breweries, ships' holds and slaughterhouses, and maintains the hygienic conditions essential wherever food products are prepared, stored or transported.



6. YOUR PROBLEM?

We have mentioned some of the major applications of 'Topane' preservatives. There are many more potential uses of 'Topane'. Perhaps, after reading this advertisement, you may think 'Topane' can help you solve a problem in your industry. Let us know about it—we shall be glad to assist you while extending our own knowledge of the applications of 'Topane'.

NAME _____

COMPANY _____

ADDRESS _____

TEL. No. _____

Please send further information on 'TOPANE'
for Application No. _____

Please arrange for representative to call to discuss 'TOPANE'
for Application No. _____

(If your interest is aroused by Application No. 6, please enclose with this coupon a brief statement of the problem.)

IMPERIAL CHEMICAL INDUSTRIES LIMITED, MILLBANK, LONDON, S.W.1

HT. 2

Fork Lift Trucks
fuelled by
BOTTOGAS Butane



Photograph by courtesy of Priory Mex Ltd.

BOTTOGAS BUTANE

PRECISION FUEL

Fork Lift Trucks fuelled by BOTTOGAS butane operate safely indoors. This Precision Fuel means safety for personnel and goods, less engine maintenance, greater efficiency and economy.

for mechanical handling



BOTTOGAS butane and PROPAGAS propane are the Precision Fuels for industrial furnaces, the glass industry, air heaters, radiant heaters, bitumen and mastic heating, floodlights, blow torches, agriculture.

BOTTOGAS butane and PROPAGAS propane come from the British Refineries of the Shell and BP Groups. They are backed by a nationwide distribution service and technical resources second to none.



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(Regd. users of Trade Marks)
Cecil Chambers, 76-86 Strand, London WC2 Phone: TEMple Bar 1234

for ALL ENGINEERING SUPPLIES -

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GAUGES, ETC.

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25 lines OILS AND GREASES

HOSES AND FITTINGS

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SOUTHWARK STREET, LONDON, S.E.1

Special Purpose Chemicals

Uses Bulletin

For the preparation of shampoos for human and veterinary use, hand cleaning gels, germicidal skin cleansers—**EXONICS**, high foaming, low odour, mild surfactants compatible with most phenolic bactericides.

For the preparation of germicidal creams and ointments, hair conditioning creams and most cosmetic emulsions where cationic properties are desirable—**COLLONE QA** (Cationic emulsifying Wax BPC).

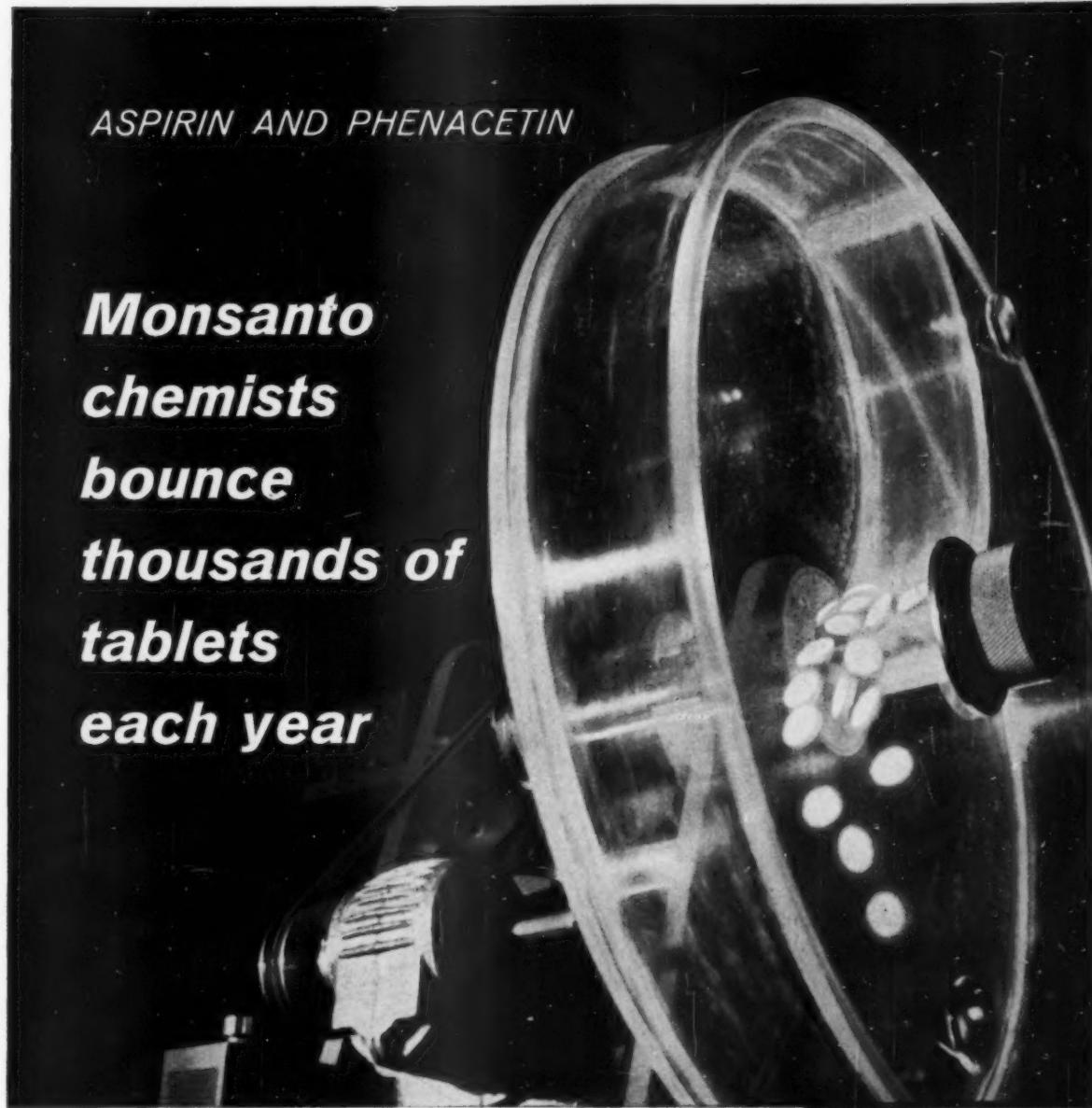
For use in dairy sanitisers, antiseptic lotions, sterilising detergents, germicidal sprays, etc.,—**MORPANS**, a wide and versatile range of quaternary ammonium compounds.

Glovers (Chemicals) Ltd., Worley Low Mills, Leeds, 12 Telephone: 63-7847/8/9 Telegrams: "Glokem, Leeds."



ASPIRIN AND PHENACETIN

**Monsanto
chemists
bounce
thousands of
tablets
each year**



Many problems met in the manufacture of tablets containing aspirin and phenacetin are being ironed out with the help of a series of tests adopted by Monsanto chemists.

The above test reveals proneness to chipping. It helps Monsanto customers produce tablets that reach the consumer as perfect as the day they were made.

Other Monsanto tests check on tablet hardness, and speed, of disintegration in use.

The tests are part of a technical service provided for all buyers of Monsanto aspirin and phenacetin. A service that helps selection of the correct grade . . . that solves formulation problems . . . that offers sound advice on the manufacture of soluble aspirin tablets.

See Monsanto for more information.



MONSANTO CHEMICALS LIMITED

922 Monsanto House, Victoria Street, London, S.W.1 and at Royal Exchange, Manchester 2.

In association with: Monsanto Chemical Company, St. Louis, U.S.A. Monsanto Canada Limited, Montreal. Monsanto Chemicals (Australia) Ltd., Melbourne. Monsanto Chemicals of India Private Ltd., Bombay. Representatives in the world's principal cities.

Monsanto
chemicals
help industry—
to bring a
better future
closer

Alginates

IN TABLET MANUFACTURE

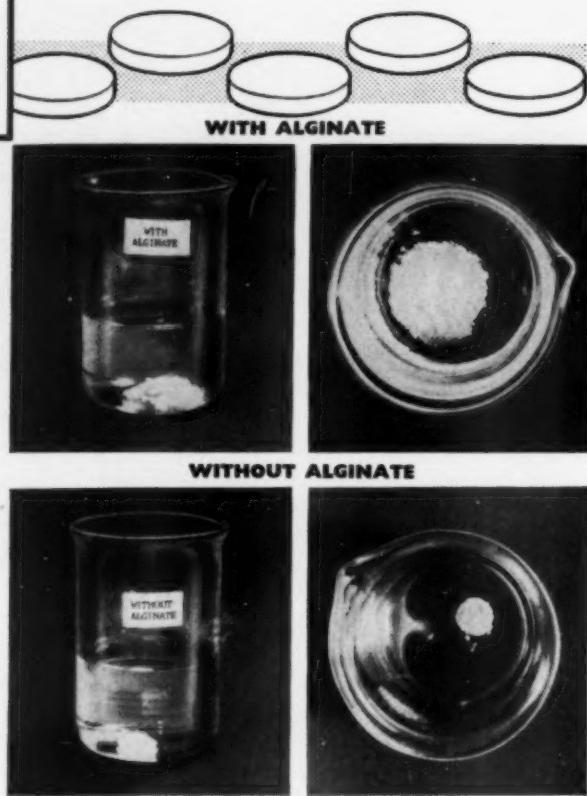
ALGINIC ACID is an excellent tablet disintegrant: even "difficult" medicaments give tablets which disintegrate rapidly and smoothly. In the manufacturing process alginic acid is easily incorporated by moist granulation; dust separation and capping are greatly reduced.

And for those who require a neutral disintegrant there is **ALGINATE P.872** a new product combining the technical advantages of alginic acid with neutral pH.

- For test samples and technical literature, write to:

ALGINATE INDUSTRIES LIMITED

Walter House • Bedford Street • Strand • London W.C.2
Telephone: Temple Bar 0451



The ptfe Diaphragm with moulded-in Stud attachment GRADE '214'

For Controlling—

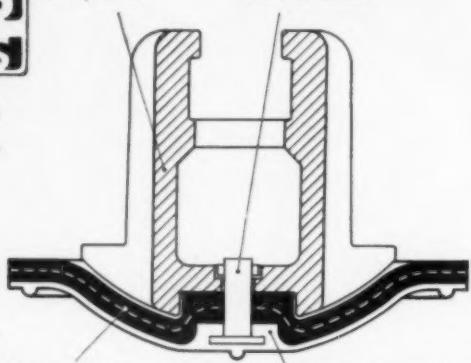
- Many chemicals at temperatures up to 150°C.
- All chemicals at room temperature.
- Chemicals at working pressures up to 100 p.s.i. (150 p.s.i. in sizes $\frac{1}{4}$ "— $\frac{3}{4}$ ")
- Chemicals under industrial vacuum conditions.

Users who have previously specified diaphragms of grades 044 and 184 will realise the vastly increased scope of the new Diaphragm Grade '214'.

Diaphragm Grade '214' requires no elaborate body preparation. Attachment is by a quick fix, push-twist Stud.

Sizes from $\frac{1}{4}$ " to 8".

Compressor



Push-twist Stud



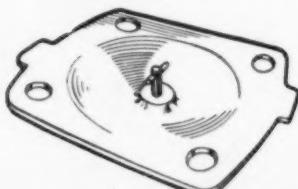
Compressor to which Diaphragm and backing are positively secured



Synthetic rubber backing



Section through typical Saunders Type A Diaphragm Valve, illustrated robust construction, isolation of mechanism and streamline passage.



ptfe Diaphragm Facing Grade '214' with moulded-in, push-twist Stud.

SAUNDERS VALVE COMPANY LIMITED, Diaphragm Valve Division, CWMBRAN, MONMOUTHSHIRE

**NEW
NEW
NEW!**



5 gallon

BLOWN High Density

Polythene Container

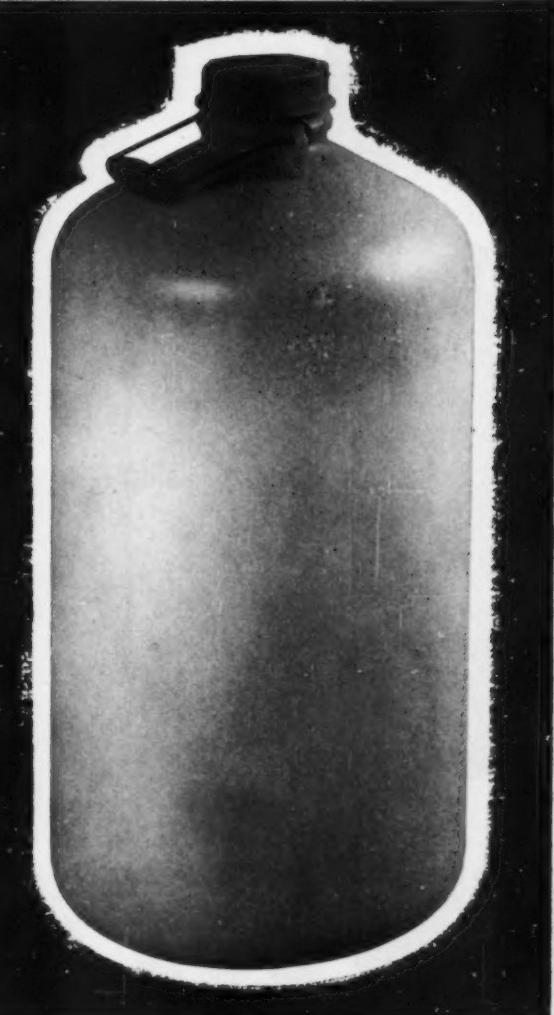
INTERESTED IN OUR FULL RANGE ?

You are bound to find what you require from 5 c.c. to 5 Gallons in the FREEFLEX range, every one of which can be delivered ex. stock. You will find that it pays to use FREEFLEX Standard Blown Polythene Containers.



IF YOU ARE INTERESTED IN CLOSURES

The SUBA-SEAL range of Positive Closures covers your requirements in the industrial field. These too are available for immediate delivery from stock.



Now . . . here is a 5 Gallon, High-Density, Blown Polythene Container designed to save you money in handling and freight costs. It is extremely rigid and will give lasting service. This 5 Gallon Container will live up to the high reputation which FREEFLEX has earned over a wide field of industry, and is especially designed for use with heavy chemicals. What is more to the point, these 5 Gallon Containers are ready NOW . . . we can give you . . .

DELIVERY FROM STOCK

This FREEFLEX 5 Gallon Container is now standard in our range which covers capacities from 5 c.c. to 5 Gallons. You can confidently order now and be sure of delivery within a few days.

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GLASS ENAMEL LINED EQUIPMENT



A Complete Plant or a Single Unit.

Designed to meet your own requirements, and lined with a Hard Glass Enamel developed during over a century of service to the chemical industry.

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20204/5

EXPERIENCE

is a BIG word at Gardners

Over 100 years of inspiration and experience are reflected in the design and efficiency of Gardner machines.

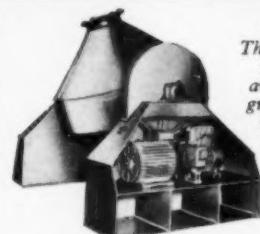
That is why most important firms choose Gardner machines for mixing, sifting, grinding or drying powders, solids, pastes, granules and liquids.

Never be in doubt about the efficiency of your processing equipment. Send samples of your materials to Gardners for a confidential test and a recommendation regarding the right machine for your particular process.

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A50



DOUBLE CONE MIXER

The ideal mixer in cases where it is necessary to avoid breaking down the granular structure of the ingredients. Controlled lateral displacement ensures a perfect mix, without attrition. In sizes from 15 lbs. to 30 tons capacity.



STIRRED BUNKER / BELT FEEDER

New, modified version. Even more efficient. Provides the perfect solution of the storage and constant-weight or volumetric feeding of difficult-to-handle materials. Remarkably high degrees of accuracy are obtainable.

Send for illustrated folder of the Gardner range of machines.



This modern centrifuge is soundly designed, constructed, and suitable for research departments, pilot plant testing or general purpose small batch processing.

Because of improved production methods we are able to offer—QUICK DELIVERY.

21" TYPE 86 STAINLESS STEEL CENTRIFUGE for laboratory or small batch processing

SIMPLE SAFE CONTROL

For safe, foolproof operation the single lever control is fully interlocked with the control panel, by means of a flameproof switch.

The adjustable stainless steel feed pipe and washing rose are standard fittings.



BROADBENT

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THOMSON & CARROLL PTY. LTD., CHEMICAL ENGINEERS, MELBOURNE, AUSTRALIA

Manufacturing Chemist—December, 1961

[D]

A51



CARLSON SHEET FILTERS find wide application in the Chemical and Pharmaceutical Industries because they are specifically designed for fine filtration. The filters are

- Ideal for the clarification and sterilisation of liquids with a low solid matter content,
- Available in 20 cm., 40 cm. and 60 cm. sizes for work in the laboratory or for large commercial production,
- Manufactured in various materials including stainless steel,
- Supplied with modifications to the standard design to suit individual requirements.

In addition to Filters, CARLSON also make their Original Filter Sheets in various grades to ensure the clarity or sterility of your particular product.

JOHN C. CARLSON, LTD.

ASHTON-UNDER-LYNE, LANCS.

Telephone: Ashton-u-Lyne 3611 (all lines)
London Offices: 16-18 Heneage Street, E.I. Telephone: Bishopsgate 4545/6.



(Photograph by courtesy of
Nicholas Products Limited.)

FOR PURITY AND CLARITY SPECIFY SPARKLER FILTERS

Sparkler Filters have been installed in the LIFEGUARD PLANT of Nicholas Products Limited, Slough because the stainless steel construction and design of filter is completely sanitary and all parts are readily accessible for cleaning.



Photograph shows s.s. Sparkler Filters installed in the Lifeguard Plant of Nicholas Products Limited.

Our expert advice is available to solve your particular filtering or clarifying problem.

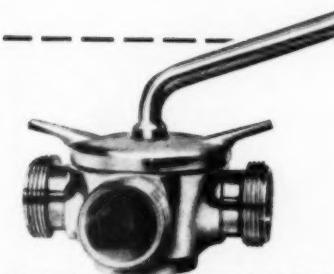
Write for details to : SPARKLER FILTER DIVISION
L. A. MITCHELL LIMITED

37, PETER STREET, MANCHESTER 2, Tel: BLA 7224/7 and 7824/7
Representing Sparkler International Ltd., Mundelein, Illinois, U.S.A.

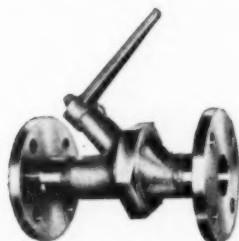
Valves IN STAINLESS STEEL

for hygienic and corrosion resistant duties

The A.P.V. Company Ltd., as one of the largest British manufacturers of stainless steel plant, have applied their experience to the development of a range of stainless steel valves and pipe fittings designed for hygienic and corrosion-resistant duties.



APV W.A. (WIDE ANGLE) COCK. A full bore and self-draining type of plug cock with a special type of sealed wide angle plug that ensures freedom from leakage and a smooth non-galling action. Made in 18/8/3 chromium-nickel molybdenum stainless steel in a range of five types in sizes from 1" to 3" and with alternative connections. Publication A.359 gives full details.



APV PARAVALVE. This ingenious hygienic valve is of a lightweight, leakproof and crevice-free construction designed to operate at pressures up to 100 p.s.i. It provides efficient flow characteristics combined with smooth action and freedom from jamming when handling hot liquids. The handle turns through 180° to rotate the plane of the valve from a vertical to a horizontal position above the centre of the pipeline. Made from molybdenum bearing stainless steel in a range of five sizes from 1" to 3" with alternative connections. Publication A.348 gives full details.



APV ZEPHYR AIR OPERATED VALVE. This air-operated, reciprocating type of valve is designed to permit remote and automatic control of pipe lines, tanks and processing plants. Of hygienic, crevice-free construction and made in a molybdenum bearing stainless steel, the Zephyr valve is available in two types, "on-off" and "changeover," with alternative port arrangements and in 1½", 2", 2½" and 3" port sizes. Publication A.349 gives full details.

APV-COOPER VALVES. A range of corrosion-resistant valves based on the well-proven designs of one of America's largest stainless steel valve manufacturers. They afford free and unobstructed flow of liquids or gases, positive shut-off and reliable performance under the most exacting conditions. The standard range covers: Split Wedge Gate Valves (½" to 6" bore), "Y"-type (½" to 6") and Disc Rising or Lowering Tank Valves (2" to 4"); the latter having optional remote control mechanism. Made in 18/8/3 molybdenum bearing stainless steel and flanged to B.S.S. (Tables D, E and F). Publication A.327 gives full details.

APV

THE A.P.V. COMPANY LIMITED

MANOR ROYAL, CRAWLEY, SUSSEX

Telephone: Crawley 27777. Telex: 8737. Telegrams: Anaclastic, Crawley, Telex

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Leading producers of **VITAMIN**

OFFER

PURE CRYSTALLINE SUBSTANCE
B₁₂ TRITURATES
B₁₂ SOLIDS

B₁₂

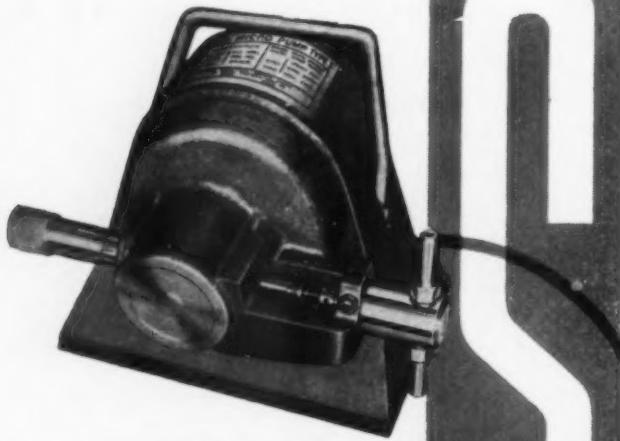
FOR ALL PHARMACEUTICAL PURPOSES

Pure—stable—high biological activity



BULK SALES DEPARTMENT, GLAXO LABORATORIES LTD., GREENFORD, MIDDLESEX. BYR0n 3434

Subsidiary Companies or Agents in most countries.



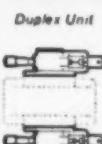
MICRO PUMP TYPE

a new

DCL metering pump



Single Unit



Duplex Unit



Plug-in Transformer



Full particulars from

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GREAT BURGH, EPSOM, SURREY.

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TAD788

December, 1961—Manufacturing Chemist

B. NEWTON MAINE LTD

SILSOE, BEDFORD · SILSOE 296

for Rare Chemicals

**with emphasis on substances produced by
HIGH PRESSURE HYDROGENATION**

Acrylophenone
Allyl oxy benzene
o-Allyl phenol
Allyl t-butyl carbonate
Allyl N-tert-butyl carbamate
Barium benzene sulphonate
Barium dihydrogen cyanurate
Barium hydrogen cyanurate
Barium phytate
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o-Benzozquinone
Benzylisothiocyanate
Butyl t-butyl carbonate
Butyl N-tert-butyl carbamate
Butyroin
2-Chloroethyl N-tert-butyl carbamate
9-Chloroanthracene
1-Chloro-3,3-dimethyl butane
10-Chlorodecanol
2-Chloro ethyl t-butyl carbonate
5-Chloro-pentanol-1
5-Chloropentyl acetate
1-Chloroprop-2-yl N-tert-butyl carbamate
1-Chloroprop-2-yl t-butyl carbonate
2-Cyclohexane acetic acid
4-Cyclohexane butyric acid
Cyclopentanol-1-carboxylic acid
Cyclohexane-1,4-dione
Cyclohexyl phenyl carbinol
Cyclohexyl phenyl ketone
3-Cyclohexyl propanol-1
Cyclopentanol-1-carboxylic acid
Cyclopentanone cyanohydrin
N,N'-Diacyl urea 98/100%
Diamino durene
2,7-Diaminofluorene
Diammonium sebacate
Di-n-butyl azelate 99%
Dibutyl pimelate
3,5-Dichloroaniline
1,1-Dichloro-3,3-dimethyl butan
1,3-Dichloro-5-nitrobenzene
Diethyl pimelate
1,4-Dihydronaphthalene
2,4-Dihydroxy isophthalaldehyde
1,4-Dihydroxynaphthalene
para-Dimethyl amino acetophenone
2,2-Dimethyl aminoobutane
3,3-Dimethyl butane
N,O-Dimethyl isothiuronium iodide
1,2-Dimethyl cyclopentanone
2,2-Dimethyl pentyl acetate
Dimethyl pimelate
2,2-Dimethyl propanol pure
2,2-Dimethyl propyl acetate
2,2-Dimethyl propyl chloride
Dimethyl sulphone
Dinitro durene
2,5-Dinitrofluorene
2,7-Dinitro fluorene
Dinitrofluorene (2,5-/2,7- mixed)
Docosa-10,12-diene-dioic acid
n-Dotriacontane

Embelin (see page 400 of Merck Index 7th)
2-Ethanol pyridine
Ethylene diamine-N,N,N',N'-tetrapropionic acid
N-Ethyl phenothiazine
Ethyl t-butyl carbonate
a-Ethyl-a-methyl succinic acid
Ethyl N-tert-butyl carbamate
Heptanediol-1,7
Hexahydroindane (cis/trans)
3-Hexanol
n-Hexatriacontane
2-gamma-Hydroxy propyl pyridine
3-gamma-Hydroxy propyl pyridine
4-gamma-Hydroxy propyl pyridine
Isophthalic acid (= meta-phthalic acid)
Isopropylcyclohexane
6-Ketoundecane-1,11-dioic acid
2-Methyl-5-aminohexane
3-Methyl butene-1 99%
2-Methyl cyclopentanone
2-Methyl heptane
1-Methyl heptylamine-1 (= 2-Octylamine)
2-Methyl hexane
4-Methyl hexene-1 99%
5-Methyl hexene-1 99%
Methyl hydrogen adipate
Methyl 2-hydroxycyclohexane carboxylate
N-Methyl-3-hydroxy piperidine
1-Methyl imidazole
2-Methyl imidazole
Methyl t-butyl carbonate
2-Methyl octane
3-Methyl octane
4-Methyl octane
N-Methyl phenazonium methosulphate
DL-a-Methyl serine
Methyl N-tert-butyl carbamate
2-Methyl tetrahydrofuran
2-Methyl thiophene
4-Nitrophenylazo-4-benzoyl chloride
n-Octacosane
Octane-1,8-diol
N-n-Pentyl succinimide
B-Phenyl ethyl mercaptan pure
2-Phenyl ethyl isocyanate
n-Propyl cyclohexane
Seleno-urea
Sodium Laevulite 95%
Sphingomyelin
Stearolic acid
n-Tetracosane
Tetracyanoethylene
2,3,5,6-Tetramethyl-4-nitro aniline
Tetraphenyl methane
p-Thiocyanophenol
n-Triacosane
Triethyl phosphine oxide
Trimesic acid chloride
Undecane-1,11-dioic acid
Undec-1-yne-11-oic acid

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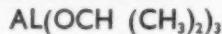
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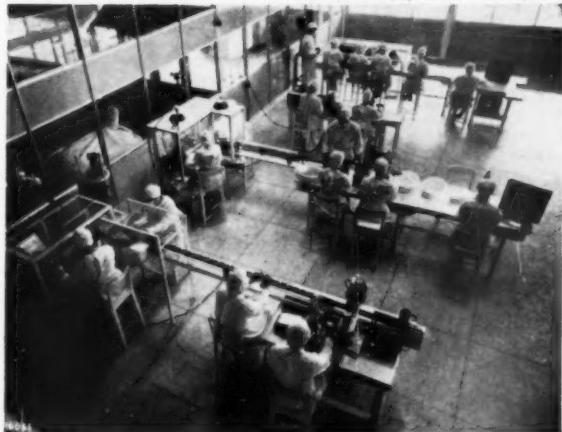
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Manufacturing Chemist

Editor: W. G. Norris

Vol. XXXII, No. 12

DECEMBER, 1961

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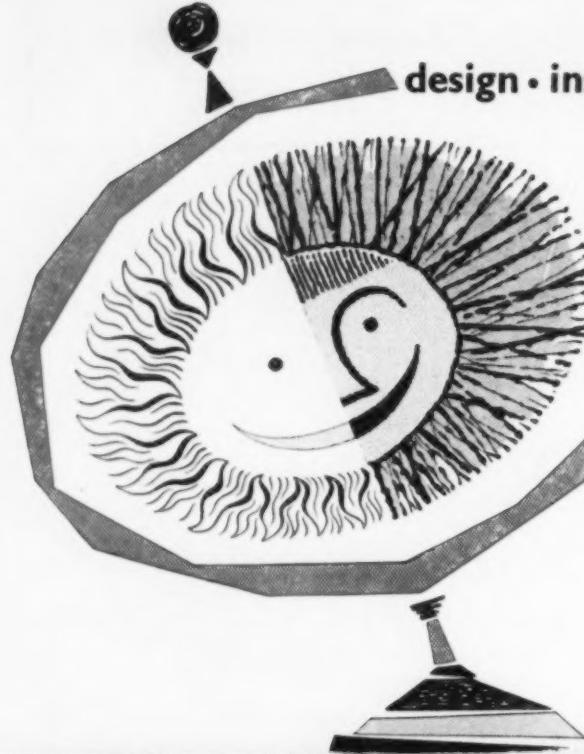
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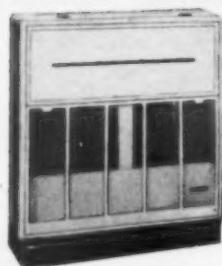
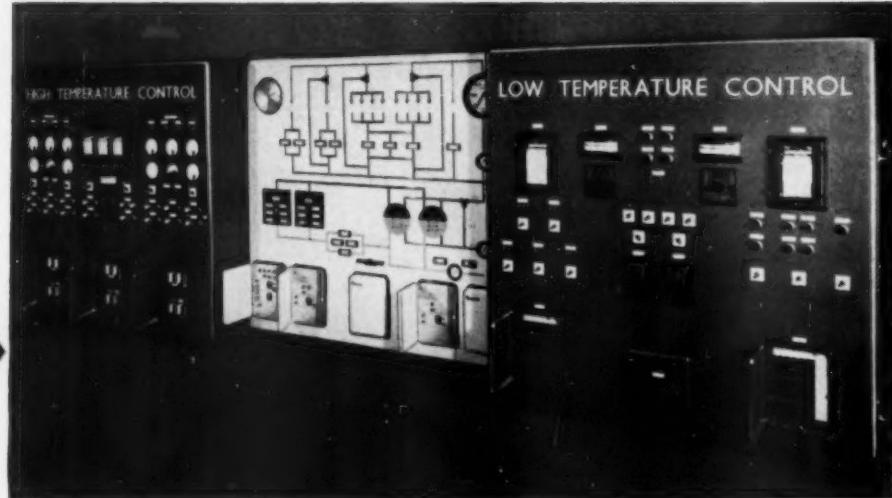
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Now a leader of the British pharmaceutical industry, Sir Harry Jephcott, chairman of Glaxo, proposes a reform of drug patent procedures to introduce more competition. He points out that because of the increasing speed of communication and of the development of processes a monopoly for a much shorter term than 16 years might be adequate to secure an incentive reward for the patentee. For a product of wide application a short term monopoly might be sufficient; for one that cost a lot to produce and which has a restricted use, the longer term would be necessary to encourage and adequately reward research. So the reform he proposes is that a condition for the granting of a patent for drugs would be that it is endorsed "Licences of Right" after a period of years appropriate to the drug. "By this device," he says, "the patentee would secure the full benefit of his patent monopoly for a restricted period but would continue to receive a royalty income for the full life of the patent. A stage would thus be reached in the life of a commercially important monopoly at which freer entry into the market would result in competition and a 'fair and reasonable price' would be determined in the open market."

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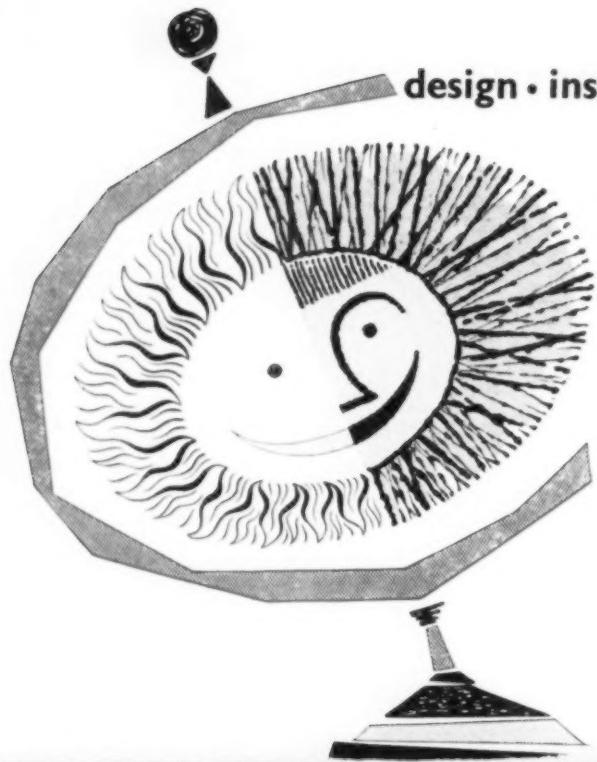
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The danger of this new report is that it may encourage complacency about the expansion of training schemes. Secondly, it may induce parents and youngsters to wonder whether the long periods of education needed to qualify are going to be as worth while by the later 1960s as they are now. The report's conclusions could undermine the favourable trends upon which its optimistic guesswork has been based. So far as supply is concerned, almost a permanent deficiency of qualified scientists in schoolteaching seems to have been accepted as axiomatic! Industry's demand has been assessed with an assumption that it will slacken off among the more advanced industries. Government research and its requirements have had to be estimated by very fallible methods. One query alone seems sufficient to upset these statistical attempts to foresee total demand by 1970—what will be the effect upon industry's methods and needs of Britain's entry into the Common Market?

In fairness to the report, the possibility of a surplus of scientists by 1970 is *not* presented as any cause for concern. It is pointed out that a surplus would enable more trained scientists to take up posts in management and administration. Unhappily many press accounts of the report have given little or no emphasis to this view. Yet the truth surely is that no industrial country hoping for reasonable prosperity can have a *surplus* of effectively trained scientists. Should we measure the demand for scientists by assessing the likely number of posts for which we *now*



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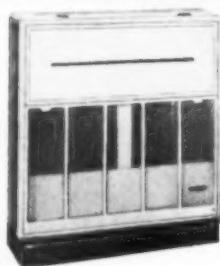
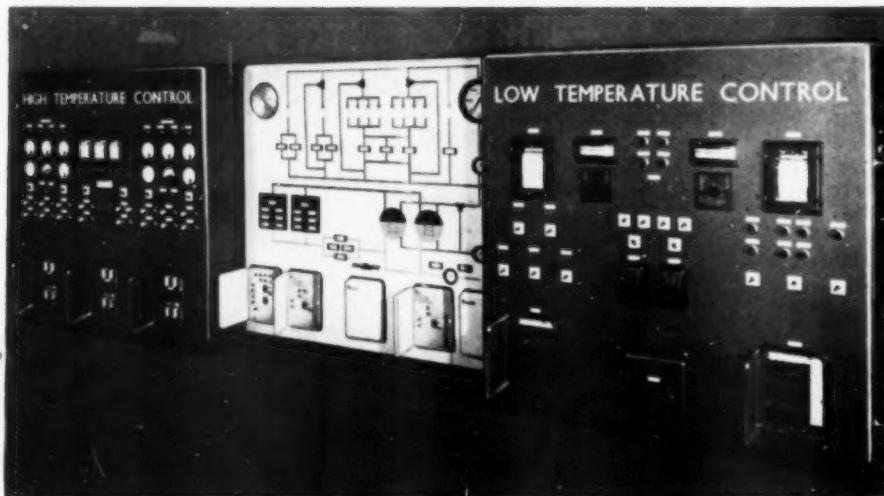
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regard scientists as essential? As the supply comes closer to equality with this direct demand, industry—and one would hope government departments also—is bound to seize the opportunity of injecting more fully trained science into salesmanship, administration, etc. This, in fact, is being done now by a number of larger firms even though it intensifies the current deficiency of scientists for scientific jobs.

At present United States industry has a ratio of scientists to technicians that is nearly three and a half times the size of ours. Yet the Advisory Council's forecast of the supply of scientists here by even 1973-74 is for only two and a half times as many as the number available in 1959. This quite distant "surplus" would not in fact by the 1970s raise British industry to the current (1960) standard of scientist utilisation in the United States.

Phoenix at Brentford

It is in times of crisis that one finds one's true friends. In business it is doubly gratifying when these friends turn out to be one's competitors. The other day we met a man who had just this experience. He is Mr. A. M. D. Charlton, chairman of the Brentford Soap Co. Ltd. One morning in August 1959 he came to his office and found the whole plant burnt out. Brentford Soap is a small company that makes laundry and industrial soaps and high-quality toilet soap for the trade. It was established in 1934 by Mr. Charlton's father and a few friends. The fire could easily have killed the business and this in fact would have happened had not Mr. Charlton's competitors spontaneously and generously come to the rescue. Levers and other soap makers made soap base and provided space and plant to keep up Brentford's supplies. Within ten days of the fire an improvised production line was in action and within another week a second was started up. The company's customers too showed sympathetic understanding and the first difficult months were surmounted and the whole staff, with the exception of a few labourers, were kept in employment.

There has been a soap factory at Brentford for nearly 200 years and this fact, plus others of more practical consequence, decided the company to rebuild. Now the new factory is in full production and capacity has been increased by 50%.

Rebuilding of the pan room started within three months of the fire and the first boil of soap from the new plant was made in October 1960. Mr. Charlton visited many soap factories on the Continent to get ideas for the new layout. New tankage and a vacuum bleaching plant has been installed, but the chief item of technical interest is a continuous automatic Mazzoni production line, the first to go into operation in Britain. This Italian plant spray-dries the soap from the pans and converts it into noodles, flakes or bars. Toilet soap base is coloured and perfumed and then gravity fed to three-roll mills. From there it passes as a continuous extrusion through an ingenious cutter and is then stamped into tablets.

Brentford's directors have high praise for the new equipment and judging from what we saw it is justified. The more expensive toilet soaps are made in short runs which do not warrant the use of automatic equipment. Tablets of all shapes and sizes are stamped out and packed by hand. Some customers want their soap wrapped in cellophane, others in pliofilm. Because of these special requirements it is difficult for one operator to wrap more than 1,000 tablets a day, which is one reason why this type of soap is so expensive. Many brands of famous perfumery houses are made at Brentford, which speaks well for the high quality of the soap.

The company can make 100 tons of soap a week. If this were all toilet soap it would amount to well over a million tablets a week. In fact, a good proportion of the output is laundry and industrial soaps, including liquid soap. All the toilet soap is made for the trade, with the exception of a small quantity which is exported under Brentford's own name. But toilet soap is a most difficult product to export, as even the soap giants have found. Looking to the future, the company is experimenting with toilet bars containing synthetic detergents. They already make one such product and are ready to make others as the need arises.

Brentford Soap is not a big company. Its employees number a bare 200. Yet production on even this modest scale requires a hefty capital. When the company started in 1934 about £10,000 was sufficient to buy buildings and plant. The rebuilding and equipping of the factory has cost no less than £200,000.

Chemicals into power

THAT fuel cells—devices for the direct conversion of chemicals into electricity—are graduating from the class of laboratory curiosity to that of practical hardware, is shown by the attitude of the oil companies towards them. Since they are portable sources of energy, fuel cells could compete with petrol and oil engines; certainly they look more promising as compact energy sources than nuclear devices. So they impinge directly on to the oil companies' big market.

Shell are working on fuel cells at their Thornton Research Centre. Now British Petroleum have come into the field. BP have allied themselves with British Ropes, Guest Keen and Nettlefolds, and with the National Research Development Corporation. A £200,000 company, Energy Conversion Ltd., has been registered by the consortium with the object of vigorously promoting fuel cell research. Several working versions of fuel cells have been demonstrated in Britain, but none has yet been produced commercially.

Probably the most advanced work is that now being carried out jointly with the United Aircraft Corporation of East Hartford, Connecticut, and the Leesona Corporation of Providence, Rhode Island. The N.R.D.C. has reciprocal arrangements with

these companies for the licensing of patents and interchange of technical information and it is intended that the benefit of these arrangements will now be transferred to Energy Conversion Ltd.

After the recruitment of technical staff the new company will engage in an intensive research programme with the ultimate aim of developing fuel cells that can be produced commercially. In particular it is hoped to develop cells which can operate on conventional fuels, including petroleum products.

Dusty death

ONE answer to the development by insects of resistance to chemical insecticides may be an inert powder. This finely divided synthetic silica has a surface area of no less than 300 sq. metres per gram. With the addition of 4·7% of ammonium fluosilicate

to give it a strong positive charge, the powder clings tenaciously to the bodies of insects. It kills them not by chemical but by physical action. It adsorbs from the outer layers of the insect's body the oils and waxes which prevent water in the body tissues from being lost. Deprived of this protection the insect loses water rapidly and dies from desiccation.

Dr. I. B. Tarshis, an entomologist at California University, tested the "death dust" against cockroaches, fleas, mites, ticks, lice, bugs and crickets. They lost between 30 and 50% of their body weight in 24 hr. and were effectively destroyed.

It is difficult to see how insects could acquire resistance to the powder, so it would appear to be a reliable weapon in the war on pests. The powder is made by the W. R. Grace Co. Its normal use is as a flattening agent for lacquers and as an anti-blocking agent for inks and paper coatings.

★ TOPICS AND COMMENTS IN THE UNITED STATES ★

The headache called Kefauver

THE bitter hostility the American drug industry has for the Kefauver Bill was brought home to us very forcibly when we discussed it with Dr. Austin Smith in Washington recently. Dr. Smith, a quietly spoken Canadian, is president of the Pharmaceutical Manufacturers' Association. He has held the post only a few years—indeed the P.M.A. itself is but three years old, having been formed by the amalgamation of two associations. Dr. Smith confessed that his time in Washington had not been as placid as it might have been because it has coincided with the investigation of the drug industry carried out by the Senator from Tennessee. The Kefauver hearings are summarised in an extremely detailed report. The drug industry was not prepared for the onslaught and undoubtedly made a poor public showing. Some of the witnesses from the industry were unprepared for the incisive probings of the Senator and his colleagues.

Now, however, the industry is fighting back hard. It has collected masses of facts to rebut the major charges. Some of these are reported in the article in this issue. It is easy to criticise the performance of the drug industry in the early stages of the hearings, but we wonder what sort of showing our own industry would put up if a similar investigation was staged in this country. Senate investigating committees have enormous power—they can subpoena anyone—and ample resources for research and fact finding. We talked both with Senator Kefauver and one of his aides, Mr. Winslow Turner, an attorney. They have an amazingly detailed grasp of their case and are optimistic about the Bill, which will be debated by the Congress soon.

The compulsory licensing provision is the bitterest pill thrust at the drug industry. Kefauver says it is the only way to break the log-jam of what he calls monopoly control. But will the investing public want

to put money into drug companies if the patent monopoly for medical inventions is drastically weakened? Kefauver's retort is that licensees will have to pay the inventor a royalty of up to 8% to use his patent and contends that this is a generous return, bearing in mind that the inventor will have three years' clear run to exploit his patent. But this is somewhat illusory because the three years could begin either from the date of the patent application or the date on which the F.D.A. let the product be used. If the application date were earlier the three-year period could expire before the drug was marketed.

The American drug industry certainly has cause to think of Senator Kefauver with something less than cordiality. But the issue is neither all black nor all white. There is bound to be give and take and in the end some useful reforms will emerge.

Anti-N.H.S.

If Kefauver is anathema to the drug manufacturer Foran strikes American doctors the same way. The Foran Bill would subsidise medical care for Americans. Its aims are nothing like as comprehensive as the British National Health Service, but it has provoked outraged cries from the American Medical Association. We asked Dr. Austin Smith what the American drug industry thought of socialised medicine and the answer came immediately and firmly, "We're against it." Dr. Smith was formerly the editor of the *Journal of the A.M.A.*, so he can hardly be expected to sympathise with state medical care. Nevertheless the National Health Service in Britain has not been entirely unprofitable to American companies, so it was reasonable to suppose that their parent firms might take a more lenient view of the Foran Bill than the doctors.

Dr. Smith thinks that nationalised medicine depresses standards and he quoted the Jewkes' survey of the N.H.S. (MANUFACTURING CHEMIST, September,

p. 391). In any case, he pointed out, the Kerr-Mills Bill makes money available to individual states to provide health care for the needy. This Bill should be given a good run before attempting to replace it with the Foran Bill, said Dr. Smith.

But we got the impression that many Americans would like to have some form of national health service. Even well-paid executives complained to us of the heavy cost of doctors' bills. One told us of an operation—performed in a quarter of an hour—that cost 700 dollars. Another, recently back in the U.S. from England—complained, jokingly of course, that his wife was inconsiderate in waiting until they got back to the U.S. before having her baby.

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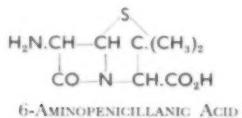
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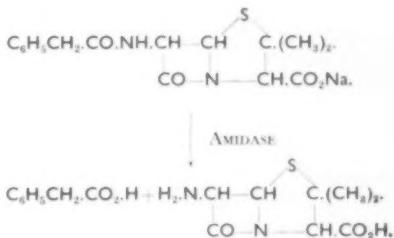
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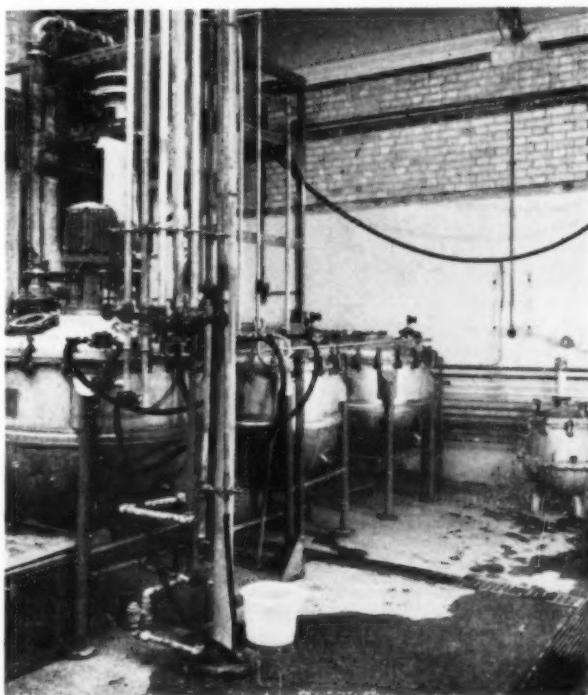


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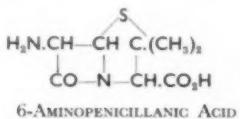
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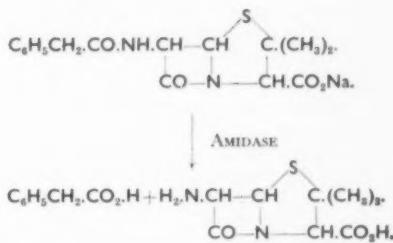
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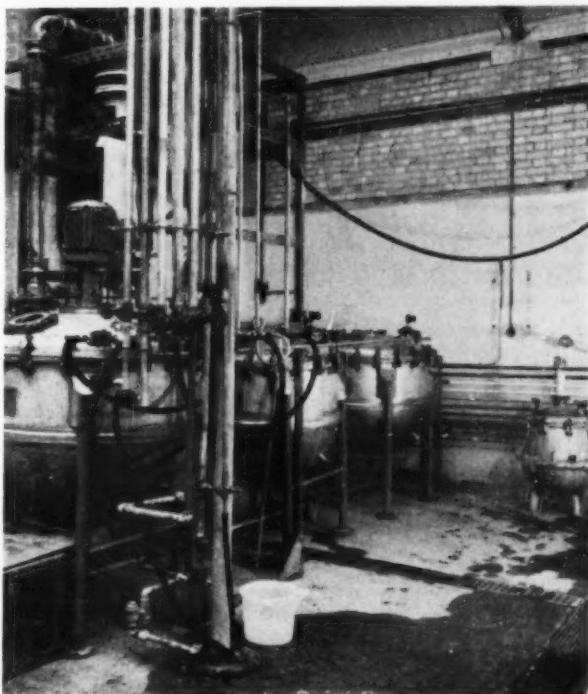


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1. Reaction with an acid chloride in semi-aqueous or anhydrous media.⁵

2. Reaction with an acid anhydride or mixed anhydride in semi-aqueous media.^{5,6}

3. Reaction with an acid in the presence of a coupling reagent such as N,N'-dicyclohexyl carbodiimide.⁷

4. Reaction with an "activated" derivative of an acid in the presence of an amidase enzyme.⁸

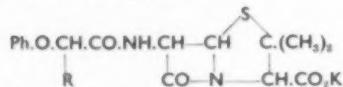
The exploitation of the 6-APA discovery by Beecham Research Laboratories, in association with Bristol Laboratories in the United States, was directed from its inception towards the following objectives of research:

(i) A penicillin having activity against the "penicillin-resistant" staphylococcus, i.e. those forms of staphylococcus, mainly confined to hospitals, which produce an enzyme penicillinase which readily destroys penicillins G and V, thus nullifying their antibacterial activity.

(ii) A penicillin, preferably for oral administration, having activity against Gram-negative bacteria. Penicillin G is moderately active against such bacteria if given by injection, but penicillin V is completely inactive.

Broxil

The first new product to become commercially available, in September 1959, fell however into neither of the above groups. It was in fact α -phenoxyethyl penicillin (phenethicillin) and its merit lies mainly in its improved oral absorption over penicillin V,⁹ a property that was discovered during clinical screening of a selection of new acid stable derivatives of 6-APA.



R = H, PENICILLIN V

R = Me, PHENETHICILLIN

R = Et, α -PHENOXY- n -PROPYLPENICILLIN

* Broxil—Beecham Research Laboratories Ltd., Registered Trade Mark.

The side-chain of phenethicillin contains an asymmetric carbon atom and since 6-APA is itself optically active the product is a mixture of two epimers. Both forms of the drug appear to be equiactive against staphylococci and streptococci, the bacteria against which phenethicillin finds its main use. Recently there appeared in the medical press some information concerning α -



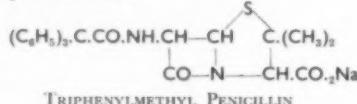
Glass-lined reaction vessels used for the preparation of a side-chain acid for a new penicillin.

phenoxy- n -propylpenicillin, a further analogue of penicillin V with even higher blood levels than phenethicillin.¹⁰

It has been known for almost ten years that penicillin V is acid stable and it has been presumed that this stability prevents its decomposition by the acid stomach secretions, allowing its subsequent absorption by the stomach or the intestine. Penicillin V, phenethicillin and α -phenoxy- n -propylpenicillin are roughly equally acid stable and the variation in their absorption obviously depends upon other factors, as yet unknown. Investigation of such phenomena may throw further light on the mechanism of drug absorption.

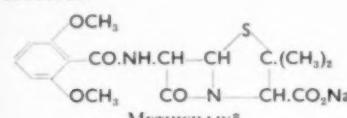
Celbenin

During the course of antibacterial screening it was discovered early in the programme of work at Brockham Park that the introduction of two additional phenyl groups into the side-chain of penicillin G gave a penicillin completely resistant to penicillinase.¹¹



TRIPHENYLMETHYL PENICILLIN

Triphenylmethyl penicillin was investigated in some detail, but, owing no doubt to the bulky side-chain, it gave very poor absorption when administered intramuscularly. Although of little clinical value, it served its purpose however in pointing the way to 2:6-dimethoxyphenyl penicillin (Methicillin) which was marketed in September 1960 and has shown itself to be completely clinically effective against penicillinase-producing strains of staphylococcus.¹²



* Celbenin—Beecham Research Laboratories Ltd., Registered Trade Mark.

Methicillin must be given by injection, but since most serious cases of resistant staph. infection occur in hospitals this is not a great disadvantage. The preparation of a compound with similar activity that can be taken by mouth would obviously be preferable for more general use. As was announced in the national press¹³ recently, several such compounds are undergoing clinical trials in this country and in the United States and the introduction of such a compound into clinical practice cannot therefore be long delayed.

The effectiveness of triphenylmethyl penicillin and methicillin against the penicillinase-producing staphylococci is undoubtedly due to the steric configuration of the side-chain¹⁴ which hinders an enzyme-substrate interaction. The exact mechanism of this interference has, however, yet to be elucidated.

In the synthetic programme carried out at Brockham Park it was quickly realised that the substitution of electron attracting atoms or groups (Cl, OMe, NH₃⁺) into the side-chain of penicillins such as penicillin G enhanced its acid stability, especially if the grouping was on the α -carbon atom. The mechanism is considered to be due to interference with the electronic displacements which initiate the proton catalysed penicillic acid rearrangement.¹⁵ Such α -substituents also increase the acid strength of the side-chain and this property has been correlated with the acid stability of the resultant penicillin.¹⁶

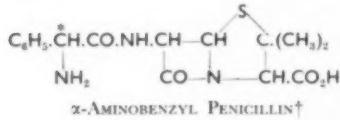
Penbritin

One member of this series, α -



Basket centrifuge for filtration of penicillins under clean conditions.

aminobenzyl penicillin (ampicillin), was found to be not only of interest for its acid stability and good absorption, but also its high activity against Gram-negative organisms *in vitro* and *in vivo*. It also retains the high activity against staphylococci and streptococci that one associates with penicillin G, the epimer containing the D(-)- α -aminophenylacetyl side-chain being generally more active. This compound can thus be regarded as the first true broad spectrum penicillin for oral use, and was introduced as such to the medical profession some two months ago.¹⁷



* This carbon atom is in the D(-) configuration.

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Thus, within five years of the first laboratory acylations of 6-APA, penicillins having three different types of activity and usefulness have been made available to the medical profession. Undoubtedly other modifications of these three types will be introduced and the range of penicillin therapy extended still further. None of these compounds can be made by normal precursor fermentation and their introduction has at least partially fulfilled the prophetic words of Sir Alexander Fleming given at the beginning of this essay.

The Discovery of 6-Aminopenicillanic Acid

Evidence for the existence of some form of "penicillin nucleus" was obtained during fermentation experiments carried out by F. R. Batchelor and Dr. G. N. Rolinson (Microbiology Department, Brockham Park). That this unknown material might be 6-aminopenicillanic acid was first suggested by F. P. Doyle, and he, together with his colleague Dr. J. H. C. Nayler, worked out the key proof to its identity which was its acylation with phenylacetyl chloride to give penicillin G. This key experiment was first carried out in the Organic Research Laboratory, using a crude solution of 6-aminopenicillanic acid. The presence of penicillin G in the acylated solution was shown by paper chromatography carried out in the Microbiology Department. Isolation of solid APA by members of the Microbiology and Biochemistry Depts. and its subsequent acylation by the chemists has led to the numerous products marketed by Beecham Research Laboratories Ltd. and other companies throughout the world.

Mr. Doyle now controls the organic chemical research, development and pilot plant laboratories of the Research Division of Beecham Research Laboratories



F. P. Doyle.

D. Mehta, Dr.

J. H. C. Nayler, Dr. M. J. Soulal and Mr. J. Wilcox and he attributes much of the rapid progress made to the work of these chemists and their assistants.

Frank Peter Doyle was born December 20, 1921, at West Ham, near London. He obtained his B.Sc. Honours in chemistry at Sir John Cass College, University of London, in 1944 and his M.Sc. in 1949 when he was working under Dr. J. D. Kendall at Ilford Ltd. From 1949-52 he was head of the chemical laboratories at Barnett-Ensign-Ross Ltd., and in 1952 joined Beecham Research Laboratories Ltd. at Brockham Park, Surrey. He now heads a staff of 75, of whom one-third are graduate chemists. Mr. Doyle is married and has three children.

REFERENCES

- F. R. Batchelor, F. P. Doyle, J. H. C. Nayler and G. N. Rolinson, *Nature*, 1959, **183**, 257. F. P. Doyle, J. H. C. Nayler and G. N. Rolinson, *British Patent Specification* 870,396 (1961).
 - F. R. Batchelor, E. B. Chain, T. L. Hardy, K. R. L. Mansford and G. N. Rolinson, *Proc. Roy. Soc. (B)*, 1961, **154**, 498.
 - Beecham Research Laboratories Ltd., *British Patent Specifications* 882,276-8 (1961).
 - F. R. Batchelor, E. B. Chain, M. Richards and G. N. Rolinson, *Proc. Roy. Soc. (B)*, 1961, **154**, 522.
 - W. Kaufmann and K. Bauer, *Naturwissenschaften*, 1960, **47**, 474. H. T. Huang, A. R. English, T. A. Seto, G. M. Shull and B. A. Sobin, *J. Amer. Chem. Soc.*, 1960, **82**, 3790. C. A. Claridge, A. Gourevitch and J. Lein, *Nature*, 1960, **187**, 237.
 - F. P. Doyle, J. H. C. Nayler and G. N. Rolinson, *British Patent Specifications* 870,395 and 880,400 (1961).
 - F. P. Doyle, J. H. C. Nayler and H. Smith, *British Patent Specification* 873,049 (1961).
 - D. C. Hobbs and A. R. English, *J. Med. Pharm. Chem.*, 1961, **4**, 207.
 - K. Bauer, W. Kaufmann and H. A. Kaufmann and K. Bauer, *ibid.*, p. 474.
 - Y. G. Perron, W. F. Miner, C. T. Holdrege, W. J. Gottstein, J. C. Godfrey, L. B. Crast, R. B. Babel and L. C. Cheney, *J. Amer. Chem. Soc.*, 1960, **82**, 3934. E. T. Knudsen and G. N. Rolinson, *Lancet*, December 19, 1959, p. 1105. A. H. Douthwaite, *Practitioner*, 1960, **184**, 793, together with numerous other references, 1960-61.
 - G. M. Williamson, J. K. Morrison and K. J. Stevens, *Lancet*, April 22, 1961, p. 847. F. L. Jackson and K. K. Rao, *ibid.*, p. 850. M. Nagley, *ibid.*, p. 851.
 - F. P. Doyle and J. H. C. Nayler, *British Patent Specification* 878,233 (1961).
 - A. H. Douthwaite and J. A. P. Trafford, *Brit. Med. J.*, September 3, 1960, p. 687, together with the six subsequent papers in the same issue. G. N. Rolinson, S. Stevens, F. R. Batchelor, J. Cameron-Wood and E. B. Chain, *Lancet*, September 10, 1960, p. 564. D. M. Brown and P. Acred, *ibid.*, p. 568. P. Acred, D. M. Brown, D. H. Turner and D. Wright, *Brit. J. Pharmacol.*, 1961, **17**, 70.
 - The Times*, October 12, 1961, p. 4.
(Continued on page 548)

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How Senator Kefauver Plans to Reform the American Drug Industry

By W. G. Norris

After hearings lasting 18 months, the Senate Sub-committee on Anti-Trust and Monopoly produced a 250,000 word report on the American drug industry which contains serious criticisms of its promotional methods and its monopoly control by the use of patents and trade marks. This report is the genesis of S.1552, a Bill introduced by Senator Kefauver, chairman of the sub-committee, which proposes drastic changes in the law relating to drugs and medicines. The Bill is being bitterly resisted by the drug industry. Recently the author was in Washington to discuss the Bill with its supporters and opponents.

CRUSADE or witch-hunt? What description you give to Senator Estes Kefauver's mammoth investigation of the American prescription drug industry depends very much on your political views, on whether you make drugs and whether you have a lot of medical bills to pay.

Recently in Washington I discussed the investigation and the resulting Bill, No. S.1552, with both sides, namely Senator Kefauver and his aide Mr. Winslow Turner, and with Dr. Austin Smith, president of the Pharmaceutical Manufacturers Association. S.1552 comes before the next Congress which convenes in January.

Senator Kefauver and his supporters contend that S.1552, which seeks to amend the anti-trust laws in order to lower drug prices, is reasonable and fair. "It does not seek to establish price control of drugs. Rather it seeks the objective of lower prices by making more effective the operation in this industry of our traditional free enterprise system," says the Senator.

The P.M.A., which was caught on the hop by the Kefauver revelations, has now recovered its equilibrium and is fighting back with an equally voluminous mass of facts and figures. It calls S.1552 "a patchwork of amendments to anti-trust, patent, and food and drug statutes that would retard the rate of notable drug discoveries by the pharmaceutical industry."

Senator Kefauver has fashioned his legislative proposals with considerable political shrewdness. He appeals to the American faith in competition and says in effect that if the drug industry argues that its success in the past is due to the competitive search for new cures, then it should do even better under

S.1552 because the Bill introduces more competition.

This is what S.1552 seeks to do.

Patent restrictions

The Bill would make it unlawful under the anti-trust laws for large drug companies to agree upon which company will obtain a patent, to agree which companies shall be awarded licences if a patent is issued, and to make similar restrictive agreements.

The hearings showed many cases where competing applications were settled by private agreement instead of by action of the Patent Office on the merits of the application. Frequently, it is argued, this resulted in patents with restrictive provisions, e.g. limiting sale by licensee to final package form only and limiting licensees to the parties to the private agreement.

The P.M.A. says that conflicting patent applications are not uncommon in the competitive drug industry and that years might pass before the proper owner could be unwound from Federal red tape. At present companies may lawfully settle conflicting patent claims by agreeing in advance that whoever eventually is determined the true inventor will license the others. This hastens to drug stores important new drugs under competitive conditions. The P.M.A. says that present laws amply provide for the prosecution of any illegally restricted agreements relating to patents and licences.

Compulsory licensing

Senator Kefauver asserts that competition is hampered because the American patent laws grant a 17-year monopoly on new drug products. He says that alone among the industrial-

ised nations of the world the United States grants product patents on drugs with no provision for compulsory licensing or any other protection to the public interest. Since drugs are vital to the health of the nation, it must be recognised that some limitations on patent monopolies are justified by the captive position of the users and the relationship of drugs to public health. The Bill would therefore grant in a drug patent the right to the patentee to exclude others from making, using or selling the patented drug for three years from the date of filing the patent application, and for an additional period, not exceeding 14 years. During this latter period the patentee would grant to every qualified applicant an unrestricted licence to make, sell and use that drug. If after the first three years and during the additional period the patentee fails to grant a licence to a qualified applicant within 90 days from the date of application in writing, the patentee is required to report such failure to the Commissioner of Patents, who has the power to terminate the patent.

A "qualified applicant" is defined as one who holds an unsuspended licence to make, prepare or propagate that drug by the Secretary of Health, Education and Welfare. The licensing of applicants is provided for under section 508 of the Bill, so any doubt as to who is a qualified applicant is removed. The royalties proposed could amount to as much as 8% of sales.

It is this proposal to which the drug industry takes the greatest exception. The P.M.A. says it could threaten the very existence of an innovative drug industry in America. A qualified applicant, it is pointed out, could be anyone in the world

The Kefauver Bill, the front page of which is reproduced below, has provoked vigorous counteraction from the Pharmaceutical Manufacturers Association; a typical manifesto is shown right.



to whom the Secretary of Health, Education and Welfare decided to give permission to make drugs. It is further pointed out that a manufacturer who refused to grant a patent licence within 90 days could have his Federal permit to do business revoked and lose the use of his patent completely. It is feared that unscrupulous applicants could force the granting of a patent without royalties by delaying negotiations. Even more than the granting of the licence the P.M.A. objects to the requirement that the manufacturer must also divulge all the information necessary to manufacture the product. This, it is said, would compel the giving to competitors of processing information that might be far more valuable than the actual licence. Since the American drug industry is now competing with some foreign companies that have pirated American processes and patents the effect of this proposal on the industry can be imagined.

The P.M.A. says that foreign companies could:

1. Legally acquire licences to all new drugs with or without paying royalties for them.
2. Automatically receive the information needed to make new drugs

DRUG INDUSTRY AT A GLANCE

Competing drug companies number in the hundreds

Only 35% of sales made by the 14 largest companies

BLS Wholesale Price Index up 20% since 1949 but DRUGS HAVE DECLINED!

Annual Average profit about 12% per cent on sales

Annual research investment exceeds 50% of profits

GREAT STRIDES IN MEDICINE

Life expectancy increased ten years since 1938

Infectious disease deaths cut 75% since 1938

Mental hospital occupancy down due to tranquillizers

TB mortality closing down due to effective drugs

Arthritis patients up and about due to hormone drugs

THE KEFAUVER COMPULSORY LICENSING BILL

As a responsible corporate unit in society, the prescription drug industry recognizes the need for laws that protect the health and welfare of the public. It has worked toward this end in the past and will do so in the future. Through the Pharmaceutical Manufacturers Association, the industry applies to all new drug legislation the test of fairness to the public and reasonableness to the industry.

The Kefauver Compulsory Licensing Bill (S. 1552) does not meet the test of fairness and reasonableness. It is frankly discriminatory legislation. Its intent is to invalidate drug patents, discriminate against large companies, institute federal licensing as a requirement for doing business, nullify the value of trademarks, and abolish trade practices legal in other industries.

By destroying the value of patents this bill would have an effect of quickly choking off competitive research—the very research that has produced the marvelous drug cures of the post-war years. Thus the parade of progress in drugs would grind to a halt.

This is insidious legislation. In the name of competition, it would hit especially hard at small companies and at the inventive individual by making the patent procedure unconscionably lengthy and expensive. The proposals in this bill to destroy the worth of a patent and to force compulsory patent licensing would set a precedent in one industry that poses a serious threat to every other industry that seeks to advance through research.

For these reasons the prescription drug industry, through its trade organization, the Pharmaceutical Manufacturers Association, urges all citizens interested in continued drug progress and all business men who believe in the patent system to join us in opposition to the Kefauver Compulsory Licensing Bill.

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efficiently, through provisions of the compulsory licensing Bill.

3. Produce new drugs cheaply because of lower labour costs.

4. Export them to the United States under existing favourable tariff regulations.

5. Make it virtually impossible for the company that developed the new drug to compete in its own country.

F.D.A. approval

At present the F.D.A. approves drugs from the point of view of safety. The new Bill would compel it to pass judgment on the efficacy of new drugs as well. The intention of this provision is to prevent the granting of patents for drugs which are only slight modifications of competitive drugs. At the hearings medical experts testified that in many cases there was no difference in the therapeutic efficacy of these molecular modifications as compared with drugs already on the market. Indeed, it was stated, in some instances the therapeutic effect was no greater, while the side effects were more serious. The situation permits the manufacturer to continually extend his patent period by such new patents which introduce slight modifications and thus to remain

insulated from competition by patent protection. It also affords new occasions for extensive promotions of so-called new drugs which are not in fact novel. Senator Kefauver says that the Secretary of H.E.W. has ample facilities at his disposal to decide on the therapeutic significance of new drugs. Such determinations should be made before a patent monopoly is invested in the manufacturer.

"We are not dealing with gadgets but products of health, life and death."

The P.M.A.'s answer to this is that some of the most effective new drugs have been produced by modifying the molecule of existing chemicals. Cortisone and the newer anti-arthritis drugs are instances. The P.M.A. says it is impossible for the Secretary of H.E.W. and his experts to determine that drugs are not only effective but are actually more effective than any similar product. The real value of a new drug is often determined in wide usage by doctors. This provision would also discourage research and delay the introduction of new and useful drugs.

Better information about drugs

At the hearings evidence was

presented that manufacturers frequently failed to present essential information on side effects in the advertising material sent to doctors. The advantages of the drug are usually emphasised to doctors while the dangers are glossed over, it was declared. Says Senator Kefauver: "I believe the doctor should have the exact findings as approved by the Secretary of H.E.W. It will be no more difficult or costly for the manufacturer to furnish to doctors these findings than its own version designed to minimise the undesirable aspects of the drug."

Prescribing drugs by generic names

Under the new Bill the Secretary of H.E.W. would have full powers to inspect drug manufacturing plants. This is essential not only to help the Secretary decide which manufacturers can be classed as qualified applicants, but also in order to give physicians greater confidence in prescribing drugs by generic names, since a company could lose its licence if it failed to pass the requirements of the F.D.A. This part of the Bill is an attack upon the trade mark system which, Senator Kefauver contends, is a source of monopoly control. He estimates the promotion expenses for the entire industry at around 750 million dollars a year, "which is about four times the total funds available for all medical schools in the United States for their education programmes."

It is contended that these expenditures, which add considerably to the cost of drugs, do not serve the normal purpose of promotion of products in increasing market demand. The consumer only buys prescription drugs when his doctor prescribes them and the doctor can only prescribe them when the patient is sick. But the widespread propagation of trade names prevents small manufacturers without financial resources from getting into the market. This part of the Bill is designed to break the "log-jam." If the physician can be assured that a given drug made by one manufacturer is from a plant meeting proper standards and the chemical structure, strength, quality, purity, safety, and efficacy of the drug are assured then the need for prescribing by trade names would be lessened. "Where drugs which are not subject to patent controls are prescribed on the basis of generic names the small manufacturer can survive. Competition

Generic Names Versus Brand Names

The marketing of ethical drugs under generic instead of brand names, one of the major aims of Senator Kefauver's bill, has been started by McKesson and Robbins. The firm began making prescription drugs in January, using raw materials supplied by its own chemical department. Now national distribution has begun of three steroids (hydrocortisone, prednisone and prednisolone) two antibiotics (penicillin and streptomycin) and a tranquilliser (reserpine) besides diethylstilboestrol, phenobarbitol, and cardiac and TB drugs.

The company's president, Mr. Herman Nolen, says that the drugs will cost about half as much as branded equivalents.

To keep down costs the company will buy new products instead of doing its own research, and will not employ medical representatives.

will flourish and consumers will benefit from lower prices."

The P.M.A. says that this provision of the Bill springs from the erroneous assumption that any drug in the "official" or "generic" family is of equal quality but cheaper than a trade-marked product. Actually, it is pointed out, about 85% of all prescriptions are for trade-marked drugs. F.D.A. testimony before the Committee showed why big variations in the purity, potency and activity of particular drugs sold under generic names have been found in Government tests. Surveys show that drugs purchased under generic names are not necessarily cheaper. When there is a difference in price it is usually so small that few would be willing to risk the chance of getting sub-standard drugs to get a minor price advantage.

* * *

Senator Kefauver says that the need for new legislation is urgent because "by any test and under any standard, prices and profits in the ethical drug industry are excessive and unreasonable. In 1959 the rate

of return in net worth in the drug industry was 18.1%, as compared with 10.5% for all manufacturing corporations, and as a percentage of sales 10.3% for drugs and 4.8% for all manufacturing corporations. According to new figures just issued by the First National City Bank the drug industry in 1960 showed a higher rate of profit on investment (after taxes and after all expenses including research) than any other industry. The time has arrived for action by the Congress to reduce the excessive and unwarranted charges upon those who are least able to afford them—the nation's sick and afflicted."

The P.M.A. makes these replies:

Competition. It is false to assert that a handful of large companies dominates the industry. There are 1,259 drug and medicine firms in the U.S. Fourteen firms have less than two-thirds of the assets and slightly over half (55%) of sales.

Prices. During 1949-59 the wholesale prices of specialist prescription drugs fell slightly while the prices for all commodities rose 20%. As a percentage of the medical care dollar, drugs and sundries represented 20 cents in 1930 and 19.9 cents in 1960. Of the prescriptions filled in 1960, 59.2% cost 3 dollars or less and only about 1.5% cost 10 dollars or more.

Profits. The drug industry ranks among the top industries as a profit earner. Its earnings are almost equal to the performance expected of individual growth companies subjected to high risks and rapid obsolescence. The published reports of 11 major firms showed a net increase in sales but a drop in net profits of 3.6% for 1960. But in spite of this a record 206.5 million dollars were invested by the industry in research against 197 million dollars in 1959. In addition the industry spent about 21 million dollars to support studies in medical schools, hospitals, etc.

It is doubtful that the whole of Senator Kefauver's Bill will pass into law. But it is equally true that the drug industry can never be quite the same again. Some reforms are badly needed and, indeed, the P.M.A. says it will support in principle some proposals to strengthen the power of the F.D.A. to assure more uniformity in drug quality and makers' standards. But "it will oppose strenuously measures that would throttle medical progress; that would single out one industry for punitive treatment unknown elsewhere."

Stop Valves for Chemical Plants

By A. D. J. Lucas*

The variety of stop valves now offered for chemical duties is so wide and complex that the correct choice of valve for a particular task requires careful and prolonged consideration. By describing the main trends in valve design the author seeks to simplify the process of selection. The article covers gate, diaphragm, pinch, plug and butterfly valves.

Gate valves

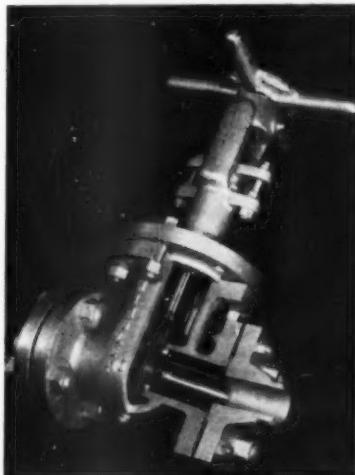
PROBABLY the best established and most widely used valve in the chemical industry is the gate valve. Its main virtues are its low price and simple construction, which results in a full clear bore creating a very low pressure drop. The conventional metal-to-metal seating gate valve has certain inherent weaknesses, however, the most serious of which is that the valve tends to leak after a period in service. This leakage is the result of deterioration of the finely finished seating surfaces due to corrosion or wear. A further disadvantage is that a valve which seals by means of a wedging action tends to seize in the closed position because of the jamming of the wedge between the metallic body seats.

New developments in gate valve manufacture have resulted in a valve which is much less liable to these disadvantages. Basically the metal-to-metal closure has been replaced by one incorporating plastics materials, of which polytetrafluoroethylene (PTFE) is probably the most widely used. In a typical PTFE seated gate valve, moulded PTFE seat rings are located in the valve body by stainless steel sleeves which pass into the valve from the flange connections. These sleeves provide the valve with what is in effect a stainless steel bore and they are also designed to prevent cold flow of the PTFE seat rings.

Furthermore, the use of PTFE, with its extremely low coefficient of friction, considerably reduces the possibility of the wedge jamming in the body.

Seats made of PTFE are, of course, much more resistant to corrosive attack than are metal seats and valves can therefore be made leakproof for much longer periods.

A further useful feature of the gate valve is that, since it seats both upstream and downstream, the body may be fitted with a bleeder plug the removal of which, when the



Hindle gate valve.

valve is in the closed position, gives positive assurance that the line fluid cannot leak past the valve.

Lubricated plug valves

The lubricated plug valve, in sizes from $\frac{1}{4}$ in. to 24 in., is used in a wide variety of chemical plant applications, its simple construction making it ideally suited to handling solids and slurries as well as the more common liquid and gaseous services. Being basically of the plug cock design, the sealing surfaces of the plug and body are not exposed to the line fluid when the valve is in the open position, so the effects of corrosion and erosion are limited. Also, since there is a straight path through the valve, there is very little resistance to flow, and pressure losses are minimised.

In valves employing tapered seating surfaces, the plug is carefully lapped into the body and a high degree of leak tightness is obtained. Furthermore, the use of tapered seats allows the plug to be so adjusted that leak tightness can be accompanied by easy operation of the valve.

Lubrication of the seating surfaces is effected by means of specially com-

pounded valve lubricants which can be inserted into the valve, either in the form of mastic sticks or by grease gun. Lubrication is carried out while the valve is fully in service, regardless of the line pressure. As well as lubricating in the conventional sense, a valve lubricant effectively completes the seal between the carefully mated seating surfaces and enables lubricated taper plug valves to be employed at pressures up to 5,000 p.s.i. or even higher. Furthermore, if a valve should become stiff to operate due to its being left in one position or to inadequate lubrication over a long period, the lubricant may be employed to build up a pressure at the small end of the plug, thus easing the plug on its tapered seat and making the valve easily operable. Recent advances in the development of valve lubricants have produced multi-purpose lubricants which can withstand most line fluids and one valve manufacturing company can now cover the great majority of applications using only two lubricants.

Most plug valves used in chemical plant are made of cast iron, which is successfully employed for a wide range of duties. In one type of valve, which is basically of cast iron, the seating surfaces are provided with a sulphate-resistant coating. This valve is widely used on concentrated sulphuric acid duties, the special seats preventing the build-up of interlocking sulphate crystals between the body and the plug which would otherwise cause the valve to become difficult to operate. For more dilute sulphuric acid which cannot normally be handled in cast-iron equipment, plug valves made of an austenitic alloy iron of the high-nickel high-silicon type, such as *Audcoley*, are successfully employed.

In addition to cast iron, many plug valves are regularly manufactured in carbon steel when high pressures are envisaged, and in austenitic stainless steels. The most common stainless

* Audco Ltd.

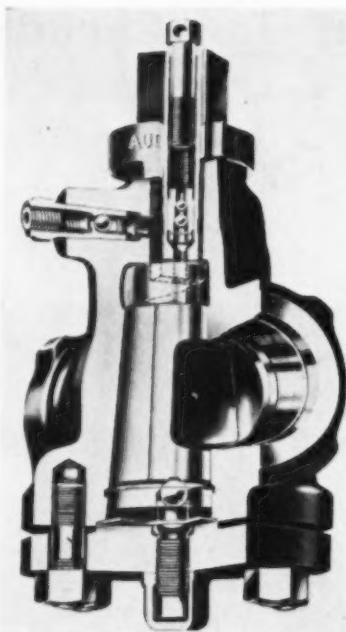
steels are the 18/8 chrome-nickel steel and the 18/10/3 chrome-nickel-molybdenum steel, but whichever grade is employed it is usual to provide some form of hard-facing on the valve plug to prevent galling when the valve is operated.

For some corrosive services, plug valves are manufactured with all internal parts coated with resistant plastics. Ebonite has for some time been used as a coating material on such services as hydrochloric acid, wet chlorine and corrosive salt solutions. More recently, thermosetting phenolic resins and thermoplastic polymers have been successfully used as valve coating materials and these have opened up new possibilities in the economic handling of highly corrosive fluids.

A further recent important advance in plug valve design has been the use of a tapered sleeve of PTFE between the sealing surfaces of the plug and body. PTFE is resistant to all chemicals except fluorine and the molten alkali metals, and its extremely low coefficient of friction enables the valve to be easily operated without the necessity for a conventional valve lubricant. There is virtually no possibility of the plug sticking in the body and, since lubrication is not required, a valve of this type is in effect maintenance free.

Although all lubricated plug valves share the same basic design, a number of variations are introduced to suit the wide variety of duties upon which they are used. For example, the *Hypreseal* design, which is employed on high-pressure applications up to 5,000 p.s.i. or more, has an inverted plug which is seated upwards into the body by means of a pressure screw in the base of the valve. The use of a pressure screw in this way enables the plug to be positively seated against high-line pressures and complete leak tightness is ensured. At the upper end of the plug, the conventional gland-sealed shank is replaced by a screwed plug stem which passes through a threaded section on the valve body. Leakage past the screwed stem is prevented by packing the threads with a plastic stem-packing compound, which is inserted through a feed unit on the side of the valve. An equaliser ring (similar in principle to an Oldham coupling) between the plug and the plug stem permits the small endwise movement of the stem during rotation.

The plug valve is also ideally suited



Audco "Hypreseal" valve.

for multiport applications and a number of multiport designs are readily available.

It is frequently possible to bring about considerable simplification of pipework and substantial valve economy by the use of valves of this type.

Most plug valves are normally operated by means of a simple wrench or in larger sizes by worm gear and handwheel, but there is a growing need for power-operated valves and a range of pneumatic and electric actuators has been developed to meet this demand.

Power operation can considerably simplify plant control by enabling valves to be remotely operated, if required, from a single central point.

Diaphragm valves

From an invention, which was first used in the gold mines of South Africa to handle compressed air, the diaphragm valve has been developed and accepted as a particularly efficient means of controlling the many difficult and specialised fluids of modern industry.

The principle of the valve involves a flexible diaphragm which closes the pipe against the flow of the fluid. Not the least important virtue of this principle is that the fluid in the pipe is permanently sealed against external contamination and, likewise, the operating mechanism that

controls the diaphragm is itself protected from any action of the fluid and can retain its lubrication.

The characteristics of the valve have been particularly appreciated in chemical works where acids, alkalis, gases and solvents must be controlled without risk of leakage. To this end, over 70 grades of diaphragm have been evolved, including a grade which has a PTFE facing with synthetic rubber backing. Diaphragms of this sort are available for valve sizes $\frac{1}{2}$ in. to 8 in. Valves of solid PTFE are also available in certain sizes. Since all working parts in contact with the fluid are of PTFE, it is likely that this valve is the most chemically resistant type in service. Typical applications are for concentrated chemicals used for dosing boiler feed water and for chemical effluents.

Maintaining a diaphragm valve consists only of an occasional diaphragm change. This saving in maintenance costs usually far outweighs the price of replacement diaphragms. There is a great variety of methods of operation, from the simple handwheel and lever designs to remotely-controlled power operation (pneumatic, hydraulic or electrical). The size range of the diaphragm valve extends from $\frac{1}{2}$ in. to 16 in. and, since bodies, diaphragms and top works are interchangeable, the possible permutations are indeed numerous.

For handling highly viscous fluids or those having a high solids content, a diaphragm valve of straight bore is often preferred. This design permits rodding or brushing-through to remove obstructions in the line and has minimum flow resistance. Valves of this design are made in sizes $\frac{1}{2}$ in. to 10 in.

At present, 19 different diaphragm valve linings are available including rubbers, metals, various plastics and glass. Hard rubber-lined valves are supplied in greater number than other linings. The reason for this is not far to seek, since hard rubber-lined valves are robust, cheap and have surprisingly wide chemical resistance.

Hard rubber-lined valves may be used on sulphuric acid up to about 78% at room temperature. Maximum recommended temperatures are normally about 85°C. Representative services for hard rubber-lined valves are dry chlorine gas contaminated with sulphuric acid mist, salt brine, spin-bath solutions, pickling lines, electrolytic tinplate

lines, dilute acids and effluents. Hard rubber-lined cast-steel valves are handling sea-water at oil refineries.

Because of their abrasion-resistant properties, soft rubber-lined bodies are often specified in the mining, quarrying and other extractive industries; they are also widely used for handling phosphoric acid in fertiliser manufacture. The inertness of polyethylene and PVC to many chemicals has been turned to account and valve bodies in these materials are proving economical for many acid services, particularly mixtures containing hydrofluoric acid.

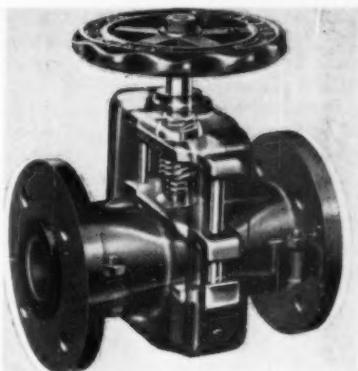
Pinch valves

Pinch valves are the commercial exploitation of the laboratory clip; they consist of a rubber tube and a mechanism for clamping it to reduce or shut off the flow through it. They have been in extensive use in the U.S. for 30 years, but have only been available in this country since the war and are therefore not so widely employed. Their greatest advantage is that when open they provide a completely straight-through full bore which has no protrusions, pockets or cracks to cause a blockage when handling thick slurries or powders. A second advantage is the isolation of the fluid from the operating mechanism. This makes pinch valves very suitable for handling corrosive liquids or any substances where metal contact is undesirable; it also eliminates sticking, which can be such a problem under certain conditions. A feature frequently not appreciated is that of the ability of a soft rubber to resist abrasion. Many cases are on record where a pinch valve has outlived a metal-bodied valve on abrasive duties by two or three times and still only required a new rubber tube instead of a complete replacement. Perhaps the major shortcoming of pinch valves is their unsatisfactory performance on

suction duties; the tube tends to collapse or fails to open. It is also not recommended to employ pinch valves on a line subject to pulsation because the tube will tend to "pant" and suffer flex fatigue.

Most pinch valves produced in this country have a metallic body enclosing the rubber tube and clamping mechanism, but it is usual in the U.S. merely to employ a framework to hold the mechanism in place. This enables the condition of the tube to be readily seen, but when a fracture occurs, there is nothing to prevent the free flow of the liquid, which could be dangerous or at least very inconvenient. It is desirable that valves bigger than 2 in. are clamped to close on the centre-line of the tube so as to avoid stressing it unduly. It is also advantageous if the handwheel is of the non-rising type which facilitates operation by bevel gear extension, chainwheel or electrical actuator. Pinch valves lend themselves to pneumatic operation for remote or automatic control but have the disadvantage of requiring considerable force to close the tube at even moderate line pressures. A patented design is illustrated in which the movement of the top pinch bar is transmitted to the bottom pinch bar through a linkage designed to give rapid closure over the first part of the travel and slow over the latter part. This has two great advantages—it reduces the thrust required to shut off, and considerably improves the valve's characteristics, which approach much nearer to linear than any comparable valve as illustrated.

Pinch valves are available in sizes from $\frac{1}{2}$ -in. to 14-in. bore for working pressures up to 100 p.s.i. and to handle temperatures of 100°C . or even slightly more. The wide range of elastomers now available enables the pinch valve to handle many corrosives. To list the possibilities would be beyond the scope of this



Warren Morrison pinch valve.

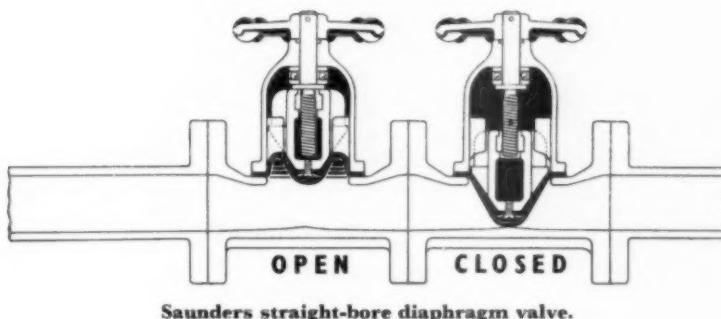
article, but the chemical engineer will know whether rubber or synthetic rubber is resistant to the fluid concerned.

Performance and economy are not always the deciding factors in valve selection and pinch valves are often specified due to their light weight—the rubber isolates the body, which can conveniently be of light alloy. The resultant valve is convenient for installation and reduces the tare weight when fitted to road vehicles.

Spherical plug valves

Spherical plug valves, contrary to general opinion, are not a new conception, various types having been in existence in industry for 30 years. However, it is only in recent times that full advantage has been taken of technological progress in elastomers and plastics in order to provide a valve which has a more general and competitive application throughout industry.

There are two main variants in general use. In one the ball plug is divorced from the operating stem and is supported by the seats so that, when in service, the pressure in the line tends to force the upstream seat on to the ball and the ball on to the downstream seat. The other variety utilises a ball plug with trunnion support, of which the one trunnion is the operating member. This design is particularly suitable for the higher pressures since the resultant load on to the ball due to pipeline pressure is borne upon correctly designed journal bearings and only a nominal seat pressure is applied on the sealing member. Both designs can take full advantage of the major strides now being made with regard to chemical-resistant rubbers and plastics, and the construction of the valve itself can be



Saunders straight-bore diaphragm valve.

from widely varying forms, *i.e.* forgings, bar stock, castings, fabrication and, in certain instances, thermosetting plastics.

Sizes range from midget, $\frac{1}{4}$ -in., 10,000-p.s.i., panel-mounted valves to 4-ft.-bore high-pressure pen-stock valves. They can be used on ultra-high vacuum services, cryogenic services, various abrasive services and all petroleum or chemical products.

The obvious advantages in comparison with other valves are low torque, certainty of operation after a period of standing with no sticking tendencies, a clean round opening port which can be venturi design or full area, low weight due to economy of metal, little or no maintenance and, as with other plug valves, 90° operation from fully open to fully shut. In the majority of designs the valve is removed from the line for periodic attention as and when required, but there is a top entry design in which the ball and seats may be taken out *in situ*. At the present time, spherical plug valves are only beginning to make their presence felt in the chemical industry, but undoubtedly their use will increase as they become more widely known.

Butterfly valves

Valves of this type are particularly suitable for isolating duties and may be used to advantage as flow regulating valves on low- and medium-head installations where the duties are not severe.

Butterfly valves are among the simplest forms of valve and this inherent simplicity makes possible a compact and economical design.

The valve blade or door may be placed symmetrically or asymmetrically to suit the torque characteristics required. In either case these characteristics are fully known over the whole range of opening and closing as a result of the extensive tests which have been carried out on prototype valves of all types.

In general, it can be said that the butterfly valve lends itself to a wider range of operating devices than most other types of valve. Operation may be performed by pneumatic, hydraulic and electrical actuators, as well as the more usual means of manual operation.

They are equally suitable for use with liquids or gases and, although generally of cast iron or fabricated steel construction, can be produced in a wide range of materials to meet

special requirements (corrosion resistance, abrasion resistance or performance at high or low temperatures).

Contrary to widespread belief that butterfly valves are "balanced" valves requiring very little operating effort, they are in fact subject to hydrodynamic or aerodynamic forces when they are opened or closed. The magnitude of these forces is largely a function of the velocity of the fluid passing through the valve and must, therefore, be taken into account when rating the valve actuator.

Valves intended for use with corrosive liquids such as sea-water can be provided with neoprene internal coatings. The butterfly valve is particularly suitable for this type of protection as the inherently clean

streamlined internal surfaces can be readily and cheaply coated.

Conclusion

It will be appreciated that there are other types of stop valves which are quite extensively employed in the chemical industry, but it is hoped that this article will, by drawing attention to the main trends in valve design, enable the chemical engineer more easily to select the type of valve which is most suited to his needs.

ACKNOWLEDGEMENT

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TRENDS IN VALVE DESIGN

Plastic Valves

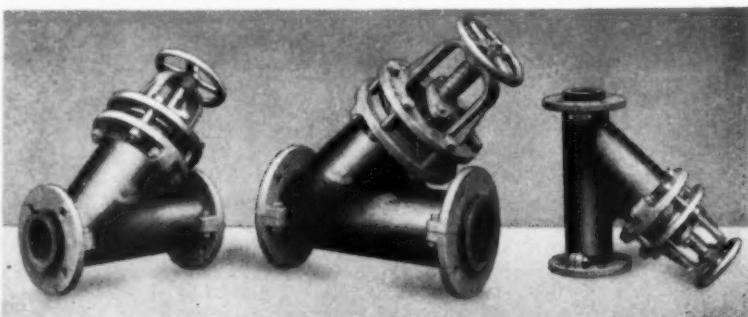
With its extensive knowledge of chemical engineering the Kestner Evaporator and Engineering Co. Ltd. has developed many valves for diverse duties. Its associate company, the Lennox Foundry Co. Ltd., has produced types specifically for acid work. Valves made of the company's special reinforced plastic, Keebush, include free flow valves and a series of diaphragm valves. Free flow valves are made entirely from Keebush and have wide chemical resistance; they will also withstand temperatures up to 130°C . The diaphragm valve, as would be expected, is of simpler construction and cheaper and its chemical resistance is restricted to that of the material of which the diaphragm is made. The most generally used diaphragm material is synthetic rubber. Similar diaphragm valves have been made of P.V.C., and they are used for chemical duties outside

the range of Keebush. They can be employed at temperatures up to 60°C .

The Lennox Co.'s valves are made in Tantiron, a silicon iron alloy, which is acid resistant, even at high temperatures. The valves are usually of two types, screwdown or plug.

Glass-lined Valves

The new Pfaudler heavy-duty glass-lined valves are highly resistant to acids and alkalis and mechanically strong. The new design has no porcelain parts. The valve head and stem comprise a one-piece unit glassed all over; internally the valve body is completely glass-lined. The seat of the new valve is made from Fluon-bonded fibre glass which yields a little to the pressure of the head when the valve is closed, giving a positive seal. The rounded shape of the glass head prevents adhesion of the product during processing. A



Chemical-resistant valves by Kestner.

glass-lined adaptor can be supplied to enable the valve to be incorporated in a pipeline. The valve, made in three sizes, is supplied by Enamelled Metal Products Corporation (1933) Ltd.

Chemical Resistant Valve

Glass and fluorocarbon plastic, two materials highly resistant to chemicals, are used in a new valve made by T. and C. Clark and Co. Ltd. A seating of *Fluon* is employed against which a glass enamel coated valve head impinges to make the seal.

Fluon is claimed to resist almost all known chemicals except molten alkali metals and fluorine gas and chlorine trifluoride at elevated temperatures. Clark's acid resisting glass enamel is also well known for its resistance to severe acid conditions (excepting hydrofluoric) and hot alkaline solutions up to pH 12. This combination makes a valve for use with all types of chemical reactors.

The usual type of valve is of the downward closing type, but risk of crystals lodging in the seating surface can be eliminated by slight alteration to the valve spindle, etc., in order to make it upward closing.

Hygienic Valves

The A.P.V. Co. developed the *Zephyr* valve to meet the need for a hygienic valve for operation manually or automatically from a remote position. It is a reciprocating valve available in two types, "on-off" and "change-over," and makes possible centralised and automatic control of pipelines, tanks and processing plants. Being designed for remote control and cleaning in place duties, accessibility does not have to be considered and layouts can thus be simplified. Freedom from the possibility of external contamination from atmosphere or operating medium is also ensured.

The *Zephyr* valve offers the further advantages of visual and remote indication of the valve position and, by the addition of a micro switch unit, can be interlocked electrically with other equipment to provide the necessary safeguards required in automatic selection circuits.

The *Zephyr* is made in 1½, 2, 2½ and 3 inch port sizes and is available with Type R.J.T., international sanitary standard, American 3A and German NW connections.



EASY CLEAN VALVE

This new two or three-way leakproof plug-cock contains no bacteria traps, minimises galling and is suitable for in-place cleaning. Known as the *Metior Floating-Plug Plug-Cock*, it consists of a tapered plug suspended in a stout but attractive barrel-shaped body. Manufacturers are Talbot Stead Tube Co. Ltd.



Air-operated valve, the "Zephyr" made by the APV Co.

Another A.P.V. valve is the *Paravalve*. A stainless steel valve, it was specially developed to meet the exacting requirements of hygienic pipelines and is suitable for cleaning in place. It provides efficient flow control combined with a non-galling action and freedom from jamming when handling hot

More Information

For fuller details of the valves mentioned in this survey, please use the Enquiry coupon on page 570.

liquids. The spindle of the valve is sealed by a hygienic rotary joint and does not rise through the packing and therefore avoids any possibility of atmospheric contamination. Essentially a butterfly valve fitting into a resilient interchangeable rubber seat located in the wall of the body, the *Paravalve* does not rely upon finely machined surfaces to make a positive seal and is, therefore, not susceptible to accidental damage or wear. Made from molybdenum bearing stainless steel, this valve is available in 1, 1½, 2, 2½ and 3 inch sizes with Type R.J.T., International Sanitary Standard and American 3A Connections.

Leakproof ball valve

The first British design of Fluon-seated leakproof ball valve has been introduced by Joshua Hindle and Sons Ltd.

The valve incorporates many of the features of the Hindle Fluon-seated leakproof gate valve.

It was decided that the only satisfactory method of sealing the ball valve was by means of "lip seal." The Fluon seat rings are moulded against the contour of the ball and the "lip seal" produces a reliable shut-off which is easy to operate.

All the potential points of leakage and failure on conventional valves have been eliminated, it is claimed. The one-piece body design cuts out gaskets, body bolting and gland bolting and, at the same time, permits of a compact shape. The face-to-face measurements conform to standard specifications.

The new valves have full diameter round bores offering no restrictions to full flow. A flush-out plug is provided at the bottom of the body and a bleed plug at the top of the body and there is no reduction of area through the valve.

The Fluon seat rings give long service and when the time comes to replace them, this can be done quickly and simply.

These rugged valves should prove very suitable for arduous duties in the chemical industries.

Building a New Chemical Plant

SELECTION OF SITE, DESIGN AND CONSTRUCTION

This article describes how a medium-sized company might develop a new chemical manufacturing project on a new site in the United Kingdom. It is assumed that the company is well established, but has only pilot plant experience in the proposed project.*

Selecting a site

THE following information is required before the first moves can be made in selecting a site:

- (1) Quantities and sources of raw materials.
- (2) Main marketing centres for the finished product.
- (3) Quantity and quality of water required.
- (4) Power requirements.
- (5) Approximate area to be occupied by the factory, together with any thoughts on future requirements.
- (6) Labour requirements, both as to type and number.
- (7) The quantities of waste material to be disposed of, and methods of treating dangerous or corrosive waste materials before disposal.

A considerable amount of time must be spent by specialists investigating all these problems if the economy and competitive power of the factory are to be at an optimum. The company may employ experts to decide these problems or it may go further and place the whole of the work in the hands of an engineer-constructor.

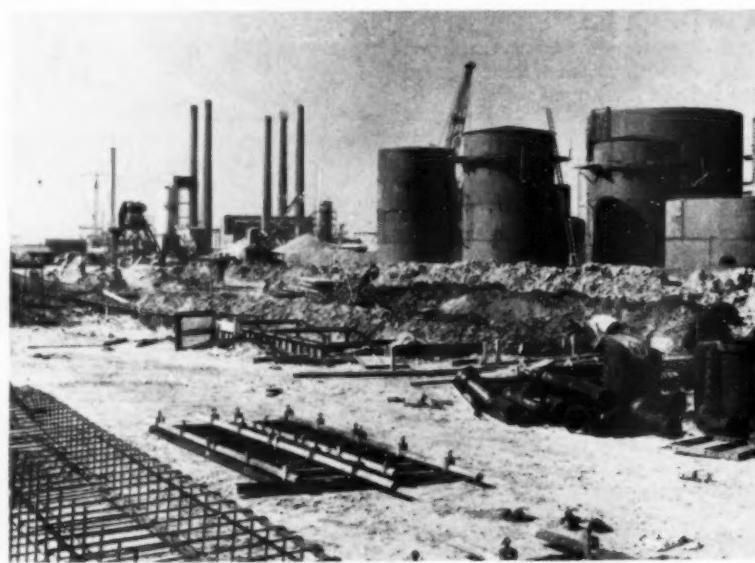
Political and planning considerations

Before planning consent may be given by a local planning authority for a new industrial building or extension with an area exceeding 5,000 sq. ft., an industrial development certificate must be obtained from the Board of Trade. The Board will naturally press strongly for the erection of the factory in a development district where unemployment exists, under which circumstances there is the possibility of financial assistance.

If harbour works are involved it will become necessary, in addition, to negotiate with the harbour authorities.

Raw material input

The cost of raw materials accounts



Choosing a site for a chemical works requires careful consideration of raw material sources, water supplies, power requirements and labour requirements. Starting from the bottom up, very thorough soil tests must be made to ensure that foundations are sound. This stage has clearly been passed at California Chemical Co.'s site at BP's Kent oil refinery. The photograph shows progress as at August last.

for 50-80% of the gross value of products for nearly all types of manufacture, and even marginal savings in basic price and transport may have a major influence on plant location.

Raw materials may come largely from one area or from widely separated points in Britain or abroad. In some cases the cost of transporting or the local availability of raw materials will determine the position of the plant, particularly if the end product is small in bulk compared with that of the raw materials. Importation by ship of a major portion of the raw materials would normally lead to a plant location

* Condensation of two papers presented at a symposium organised by the Chemical Engineering Group of the Society of Chemical Industry—"Selection of the Site for a Chemical Factory," by L. J. Murdock, and "Design and Construction of a New Chemical Plant Project," by T. T. Whipple and M. E. Roberts.

within or near an existing harbour.

If transport of the finished product is as much a problem as that of the raw materials it may become desirable to place the factory as near as possible to the markets, or near dock facilities if there is a large export trade.

Marketing areas

Marketing varies according to the type of products being produced. It is important to take into account the arrangements for reception by the customer, whether by rail or road. If the products are bulky, highly perishable, or of a type for which special transport arrangements are necessary and high transport costs are incurred, it is specially important that the plant be situated near the market. Sulphuric acid is an example.

Often the finished products have a wide distribution, e.g. pharma-

ceuticals. The transport arrangements in this case may be a major factor in locating the factory.

Water and waste

Water is essential for steam production, in processes, for cooling and for carrying away chemical waste. The problem is not only one of ensuring adequate supplies, even under drought conditions, but also that of providing water of the necessary purity. Water may be obtained from the sea, rivers, reservoirs formed by damming mountain streams, the effluent from sewage plants, or pumped from wells or mine workings.

Waste from a chemical factory may include solids, particularly clinker and fly-ash from coal, various liquids and aqueous solutions, and perhaps gases. Inert solids present little difficulty after a suitable place for distribution has been found. They may be transported dry by conveyor belt if the distance is short, by road or by rail, or by slurring with water and pumping to a lagoon or other settling ground.

Liquids and aqueous solutions usually present more difficulty and special treatment may be necessary to render them innocuous. Advice may be obtained from the D.S.I.R. Water Pollution Research Laboratory.

Certain effluents may be highly toxic, such as waste material from penicillin and other antibiotics. Under these circumstances advice can be obtained from the Industrial Health Research Board of the Medical Research Council. Phenols, disinfectants, weedkillers and other organic chemicals have been successfully treated by biological methods.

The most attractive and generally the most reliable method of disposing of waste is by discharge into public sewers. However, it is necessary to agree with the local authority on the volume and constituents of the effluent. Again, there are limits to the amount of waste that can be discharged into rivers. Discharge into the sea naturally presents less difficulties, but a long outfall pipe will be necessary.

Power supply

The four main sources of power are likely to be electricity, coal, oil or gas. Electricity may be taken from the national grid or it may be preferable to install a power house to deal with part or all of the requirements, or as a standby in

case of a general breakdown. Gas is cheaper as a source of heat than electricity, but dearer than coal or oil. It is therefore unlikely to be an important factor in plant location.

Coal or oil may provide the source of power, or in themselves be the basic raw materials for chemical manufacture. The availability of these materials may be an important factor in site location.

Investigation of foundation conditions

Foundation costs may form a substantial proportion of the constructional costs on the site. Foundations should be adequate to carry the imposed loads without undue settlement which can lead to heavy maintenance costs both in buildings and in undue stresses laid on plant, piping and vessels. In order to provide sound foundations thorough soil tests must be made.

Enquiry to engineer-constructor

This enquiry should define the scope of the work expected from the engineer-constructor and the technical information and services which the owner is prepared to supply throughout the engineering and construction of the project. These include:

1. An outline of the process technical information which will be made available.
2. Specifications and characteristics of raw materials.
3. Specifications of products.
4. Basic process flow diagram with heat and material balance of the pilot plant operations.
5. Basic safety considerations developed during pilot plant operation experience.
6. Definition of amount of storage of raw materials and products to be provided.
7. Any company practices or standards he wishes designs to incorporate.
8. Whether the site civil engineer will be engaged by him directly or whether he wants the engineer-constructor to supply the overall management of the project.
9. Provisions for future expansion.
10. Extent of utilities generation and offsite facilities to be included in the overall project.
11. Expected time of completion.
12. Type of contract desired.
13. Extent of secrecy expected.
14. Extent of initial operation assistance expected from the engineer-constructor.

Tender from the engineer-constructor

This is greatly influenced by the completeness with which the owner's enquiry has been prepared. The engineer-constructor will outline his experience in this field, his available staff and his probable terms of contract. This can be generally offered in a short time and helps the owner to reduce the number of engineer-contractors with whom he may wish to deal on a formal proposal.

Several types of contract are common in the chemical plant construction fields: cost plus a percentage fee; cost plus a fixed fee; cost plus a percentage fee with a guaranteed maximum and participation in the savings; and lump sum selling price.

Engineering staff and administration

Lines of authority and communications in both the engineer-constructor's and the owner's organisations must be established as soon as possible. Likewise basic data must be established and distributed as required. For this overall co-ordination a project manager must be employed, who must act as link between the two organisations.

Supporting engineering staff consist of project engineers for each primary area, chemical engineers, mechanical engineers, mechanical specialists, instrument specialists, electrical engineers, and cost estimator. Support from other departments will include design drafting, purchasing, expediting of equipment deliveries, shop inspection, accounting and commissioning.

Process and mechanical designs are then prepared. When this is completed equipment can be procured. At the completion of this engineering and purchasing period technical data books are generally prepared incorporating basis of design, flow diagrams, plot plans, specifications, equipment schedules and data sheets, manufacturers' instructions, index of purchase orders, and an index of manufacturers' certified prints. These are of particular value to the owner for maintenance and operation of the plant.

(Continued on page 548)

Toxicity Testing of Drugs

Wyeth's New £40,000 Facilities at Havant

A COMPLETELY new chronic toxicity unit costing approximately £40,000 to build and equip has been opened by John Wyeth and Brother Ltd. at their research and development division at Havant, Hampshire. It comprises laboratories, animal housing and animal breeding facilities.

The laboratories and certain animal rooms provide facilities for toxicological examination of potential CNS drugs and antibacterials, the compounds now being synthesised by the organic research department. One important aspect of the toxicology of new compounds is the study of the effects of their daily administration over a period of several weeks. Pharmacological research will have indicated the acute effects of the compounds at different dose levels, but it is also most important to know if continued administration produces other effects which only become apparent after some time has elapsed. The most frequent possibilities are degenerative changes which may appear in the central nervous, blood, skeletal or digestive systems, with possible liver or kidney damage. A long-term chronic toxicity study also enables potential



The new chronic toxicity unit at John Wyeth's, Havant; it cost £40,000 to build and equip.

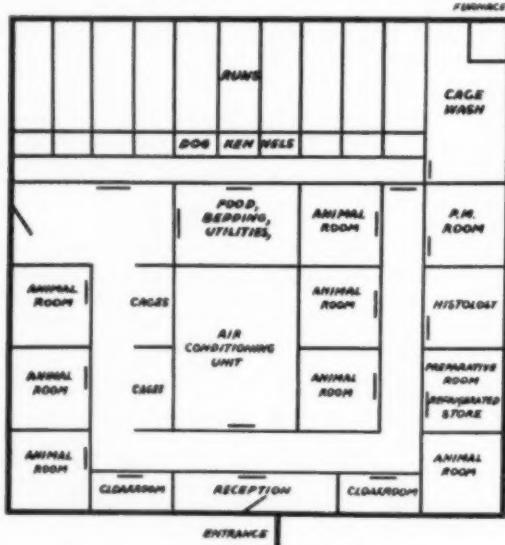
carcinogens to be eliminated.

The compound under test is usually given to three species of animals—mice, rats and dogs—using the route of administration that will be used therapeutically in man. Mice are usually kept under treatment from 4 to 12 weeks, rats from 12 to 24 weeks, and dogs from 24 to 52 weeks. Young growing animals are used at the beginning of the tests and their rate of growth under treatment with the compound is compared with the rate of growth of corresponding normal animals kept under the same conditions.

The blood picture is examined at regular intervals and tests of liver and kidney function carried out at the same time. At the end of the period of administration of the compound some of the treated animals and some of the controls are killed and all of their tissues are examined histologically for evidence of change. Some of the treated animals and some of the controls are also kept for a time, usually corresponding to the length of time that they were under treatment and testing. These animals are then autopsied and a full histological examination is carried out. This part of the test would show any changes that might be induced by the compound but only become apparent after the animal has returned to its normal diet. It is difficult to equate the length of time for which an animal has received a compound to the length of time it would be safe to give it to man, but a compound passing the above type of test might reasonably be considered safe for normal occasional use in man. If the compound would have to be given daily as a therapeutic measure over a long period of time, then the chronic toxicity tests would of course have to be correspondingly much longer.

The remaining animal rooms are devoted to animal breeding to meet the increasing demands both of the chronic toxicity screening and of the adjacent pharmacological research department.

(Continued on page 557)



CHRONIC TOXICITY AND ANIMAL BREEDING UNIT

How Big Should A Storage Tank Be?

By A. Battersby

Storage tanks are vital to the operation of chemical factories, yet they are almost always installed by guesswork. Great savings can be made by substituting science for guesses. The author shows how this can be done.

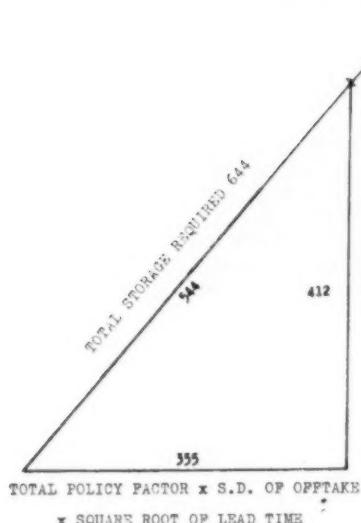


Fig. 1. Finding required storage graphically.

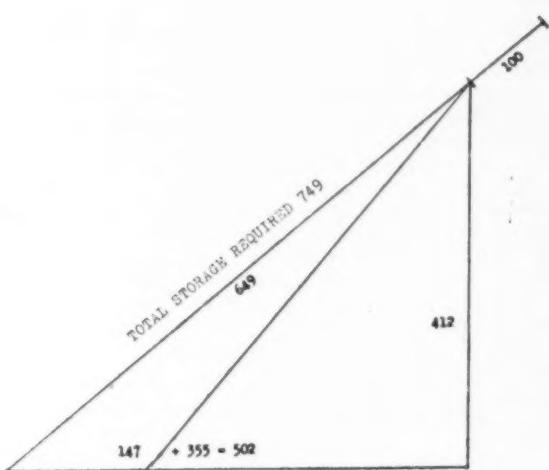


Fig. 2. Sensitivity to change in lead time.

WHEN a new chemical factory is being planned the designers will devote a lot of thought to, say, a fractionating column. Its required performance will have been derived from research and studies on a pilot plant and the greatest care will be taken to ensure that the finished unit complies with these requirements; the sophisticated chemical engineer will no doubt be improving his plate-by-plate calculations with the help of an electronic computer.

Contrast this with the approach to stock tanks in the same factory. "What do you think, Jack—two fifty-ton product tanks?" "Better be on the safe side: make it a couple of hundreds."

Yet these storage tanks fulfil a definite function in the operation of the plant—a function which can be defined in quantitative terms. Storage has long been the ugly duckling in the brood of unit processes, through lack of understanding of its precise purpose. This attitude cannot continue: the savings obtainable from the correct design and operation of storage units are too great to be ignored.

The purpose of a storage tank is to uncouple the rates of flow of

material upstream and downstream; it does this in such a way that a change in one flow produces a change in the other which is smaller in magnitude than it would otherwise have been, or which occurs at a different time. In this article I shall try to show how this principle can be translated into quantitative terms by applying it to one example, using simple graphical methods.

Case example

Batches of product are delivered from the factory to a storage tank, from which orders for customers are filled. The batch size is 100 tons, the variation in this being negligible. The Production Planning Office decides when to call for the manufacture of a batch, and it will usually be delivered to stock a week later. This delay (the "lead time") varies considerably, being normally distributed about the mean with a standard deviation of 0.25 week.

An analysis of deliveries to customers in the past shows that the offtake has a slight upward trend but no perceptible seasonal effect; it has remained fairly steady at 330 tons a week, with random fluctuations equivalent to a standard

deviation* of 71 tons per week.

We build up the required storage space from four components (see Fig. 3):

- i The space needed to accommodate a batch when it arrives, in this case 100 tons.
- ii The "positive buffer stock," providing a reserve against high offtake, late arrival of a batch, or both.
- iii The "negative buffer stock," being a reserve of storage space against low offtake and early arrival, or both.
- iv An allowance for "bottoms," heating coils and other unavailable storage space. This is a matter of engineering design and special properties of the product to be stored; it will be ignored here.

In order to calculate the two buffer stocks we must specify a "policy factor" or "risk factor" for each. In theory, perfect pro-

* A simple graphical method of finding the standard deviation is given in Chapter 3 of "A Guide to Stock Control" by the author of this article, to be published shortly for the British Institute of Management by Pitman.

tection against inadequate stock (or insufficient storage space) requires an infinitely large tank; we must accept something short of perfection, expressed as a *risk* of not having stock or space when it is needed. If we can ascribe real *costs* to these contingencies, the policy factors may be calculated from them. In my own experience such costs have proved so difficult to evaluate that an arbitrary *policy* has had to be adopted rather than a calculated *risk*. Without delving too deeply into the statistical background, we can say roughly that a policy factor of 2 will give us a stock which is inadequate once in every 40 replenishment periods, whereas for a factor of 3 the risk is once in every 740 periods. In the case under discussion 740 periods is about 14 years, so a policy factor of 3 may be said to represent virtual certainty.

It is convenient to calculate the *sum* of the two buffer stocks by adding the separate policy factors. Let us suppose that in this example we have taken 3 for the positive and 2 for the negative buffer stocks, a total of 5.

A. Calculate—

$$\text{Total Policy Factor} \times \text{Standard Deviation of Oftake} \times \text{Square Root of Lead Time} = 5 \times 71 \times 1 = 355$$

B. Calculate—

$$\text{Total Policy Factor} \times \text{Mean Oftake} \times \text{Standard Deviation of Lead Time} = 5 \times 330 \times 0.25 = 412$$

C. Draw lines proportional in length to these two figures at right angles to each other. Complete the right-angled triangle and measure the hypotenuse. (544). See Fig. 1.

D. Add the batch size to obtain the total storage (644 tons).

In round figures, the total storage needed is 650 tons, and this should suffice during normal running.

Effects of changes

We can show that a 10% increase in offtake would call for a total capacity of 676 tons. If we also expect its standard deviation to increase, say by 5%, we then derive a new storage requirement of 689 tons.

Oftake 330 tons/wk. (S.D. 71). Storage 644 tons.
Oftake 363 tons/wk. (S.D. 75). Storage 689 tons.

The storage changes by 1.4 tons per ton of mean offtake, but notice that when the offtake increases the storage capacity in weeks falls from 1.95 to 1.90.

The same methods can be used

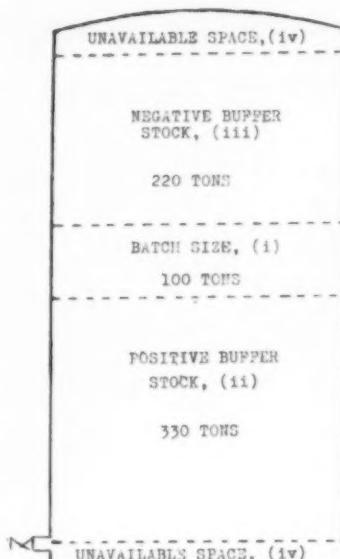


Fig. 3. Components of storage.

when we have doubts about the values used. If we do not know the standard deviation of the lead time, we might guess that it will be between 0.1 and 0.3 week. These two values give total storages of 491 and 709 tons respectively; the large difference indicates that it would be worth while to find the standard deviation of the lead time within much closer limits.

On the same principle we can extend Fig. 1 to show the cost, in terms of storage, of a delay. If we believe that the lead time is liable to be extended for a week in abnormal circumstances, we might well consider enlarging our storage capacity correspondingly. We recalculate A with a lead time of 2 weeks ($5 \times 71 \times 1.414 = 502$) and use this to draw a new triangle as in Fig. 2. The buffer stock now becomes 650 tons and the total storage 750 tons.

The shape of our triangle will also give us a rough indication of the effects of changing certain factors. A tall thin triangle means that the buffer stocks will be sensitive to the variables which contribute to the longer side and insensitive to those in the shorter side.

The methods of calculation given here are approximate ones, and many of the variables may have to be estimated. Nevertheless, they do represent a considerable improvement on the pure guesswork which is so often used.

BUILDING A NEW CHEMICAL PLANT

(Continued from page 545)

Plant construction

The areas of responsibility of a construction organisation cover such aspects as tools, construction methods, labour relations, local purchasing, accounting and cost control, and hydrostatic and mechanical tests. As construction progresses it is necessary to establish that the equipment has been properly manufactured, therefore each piece must be tested in accordance with the governing codes or specifications and is usually witnessed by a representative of the owner.

Plant operation

To ensure that the plant will be started up and operated in accordance with the process design, detailed operating instructions are usually prepared. These instructions are the joint effort of the process engineer, the project engineer and the chief operator. Every effort is made to complete these instructions well in advance of the completion of construction. Operators are also assigned to the project before it is completed so that they can familiarise themselves with the layout of the plant.

After hydrostatic testing it is necessary to run in the mechanical equipment. This is usually done by filling the system with water and running the pumps for a period of time. Control devices are set to maintain design conditions as nearly as possible.

After this all that remains is the accounting. A code of accounts is used which is sufficiently complete to allow each and every operation and piece of equipment to be classified and costs enumerated.

THE NEW PENICILLINS

(Continued from page 535)

14. F. P. Doyle, J. H. C. Nayler *et al.*, to be published.
15. J. R. Johnson, R. B. Woodward and R. Robinson, in "The Chemistry of Penicillin," p. 445. (Princeton University Press, 1949.) E. P. Abraham, *Giornale di Microbiologia*, 1956, **2**, 102.
16. F. P. Doyle, J. H. C. Nayler, H. Smith and E. R. Stove, *Nature*, 1961, **191**, 1091.
17. G. N. Rolinson and S. Stevens, *Brit. Med. J.*, July 22, 1961, p. 191. D. M. Brown and P. Acrel, *ibid.*, p. 197. E. T. Knudsen, G. N. Rolinson and S. Stevens, *ibid.*, p. 198. G. T. Stewart, H. M. T. Coles, H. Smith and R. J. Holt, *ibid.*, p. 200.

Perfumes for Cosmetics

10. BABY PREPARATIONS*

By V. Vasic, C.H.E.

*Babies are bathed, oiled and powdered to keep them clean and sweet-smelling.
Mother and baby are very influential customers and one way to keep them both
satisfied with a baby product is to give it a pleasant fragrance.*

PERFUME for baby preparations must be selected with the utmost care to exclude ingredients which may irritate sensitive skins. Perfumes should be chosen on the results of thorough testing on adults.

Of the various types of organic compounds which occur in essential oils, alcohols and esters are least likely to be harmful, while most aldehydes and phenols are highly irritating. Some perfumery materials act as primary irritants, but most are sensitizers, causing an allergic response after repeated applications to the skin. Into this category belong methyl heptine carbonate, methyl nonyl acetaldehyde, cinnamic aldehyde, citral, benzylidene acetone, eugenol, heliotropin and vanillin. If hydroxycitronellal is used, it must be very pure.

Baby skin oils

Probably the most important preparation is baby skin oil. It is used on newborn infants, and even when soap and water baths are begun its use usually continues. Oils are applied after the bath to help prevent chafing and they are also used as cleaning agents when soap and water is contra-indicated.

Most baby oils are based on light mineral oil and vegetable oils such as olive, cottonseed, corn, sesame and peanut, used either separately or in admixture. Antioxidants and antisepsics are sometimes added. Antioxidants retard the development of rancidity of the vegetable oils which could produce irritating oxidation products. The antioxidants may include propyl gallate, butylated hydroxyanisole and tocopherol, but not hydroquinone because it irritates. Some baby oils contain 8-hydroxyquinoline, chlorobutanol or hexachlorophene as the antiseptic. Chlorothymol and chlorobutanol have now been replaced by hexachlorophene. Bithionol is

also recommended as an antiseptic.

The concentration of perfume in baby oils is usually 0·1%.

Perfume A.P. 23 For Baby Skin Oil

Deltyl, Givaudan	..	..	30
Lavender oil	..	..	20
Opopanax No. 26, Givaudan	..	..	10
Citronellol	..	..	10
Geraniol	..	..	10
Bergamot oil	..	..	10
Citron Soluble L.G., Givaudan	..	..	5
Musk ketone	..	..	2
Portugal soluble L.G., Givaudan	..	..	2
Corps Orange, 10%, Givaudan	..	..	1
			—
			100
			—

Baby scalp oils

Baby scalp oils are very similar in their composition to baby skin oils. Seborrhoeic dermatitis of the scalp, usually known as "cradle cap" or "milk crust," is one of the commonest conditions seen during a baby's first year. Regular use of a baby scalp oil after shampooing will help prevent this condition.

Perfume A.P. 25 For Baby Scalp Oil

Deltyl, Givaudan	..	..	27
Malvia, Givaudan	..	..	30
Bergamot oil	..	..	15
Linalyl acetate	..	..	10
Jasmonyl, Givaudan	..	..	5
Rhodinol	..	..	5
Thibetolide, 10%, Givaudan	..	..	2
Citron Soluble L.G., Givaudan	..	..	5
Orange Soluble L.G., Givaudan	..	..	1
			—
			100
			—

Baby lotions

These are increasing in popularity, probably at the expense of baby skin oils. They are usually o/w emulsions and may be formulated like complexion and cleansing milks. O/w lotions have the advantage over the oils in providing a source of water for the water-soluble soil. Anionic, non-ionic or cationic emulsifiers may be used, as well as the combinations of nonionic-anionic or

nonionic-cationic emulsifiers. The nonionic and nonionic-cationic emulsions have the advantage over other types of permitting formulations which conform to the acidic pH of normal skin. The emollients, antisepsics and other additives may include those described in baby skin oils. Antiseptic baby lotions may be prepared with cationic quaternary ammonium, pyridinium, and morpholinium salts, as well as with the newer amino amphoteric surface-active agents which have antiseptic properties at acidic pH values.

As with baby skin oils, the antisepsics used in baby lotions should be perfectly harmless to infant skin, and if vegetable oils are employed and an antioxidant is included, one considered to be dermatologically safe should be used at its lowest effective concentration.

The concentration of perfume should be the lowest possible (the less the better).

Baby creams

Although frequently used during the early months of an infant's life, baby creams really come into their own when skin oils and lotions are discontinued. Creams are used where a greater emollience and lubrication is desired than is afforded by the baby skin lotions with their higher water content. While the lotions are used for cleansing the diaper area and as light lubricants in skin folds, the creams find greatest use in areas requiring more effective skin softening and protection, particularly following the daily bath.

Formulation for cold creams, for

* Previous articles in this series have covered: Face Powders (July 1958), Face Creams (August), Lipsticks (October), Deodorants (June 1959), Bath Preparations (September), Sun Tan Preparations (December), Depilatories (August 1960), Hand Preparations (September) and Shaving Preparations (October).

foundation creams and for all-purpose creams may be modified to produce perfectly satisfactory baby creams. The manufacture of baby creams is the same as for adult creams. They may be o/w or w/o emulsions. The nonionic, nonionic-cationic emulsions offer the advantage of permitting formulation at skin pH values. Cationic ammonium, pyridinium and morpholinium compounds may be added at concentrations of 0.1 to 0.25% to those formulae which do not contain free fatty acids.

The concentration of perfume is usually 0.1%.

Baby powders

Baby powder is one of the biggest of all sellers in this market. Baby powders are similar in composition to other toilet powders, except that they may contain an antiseptic ingredient and are not so highly perfumed. In addition, they must resist urine and neutralise its odour.

Baby powders are used principally as lubricants in skin folds, to prevent chafing, to absorb perspiration and relieve prickly heat, and to impart a clean, pleasant fragrance to the skin.

Talc is the main constituent of baby powders. The starches, especially corn starch, are also used in place of talc. Its proponents claim that it does not dust as freely as talc, it is a good absorbent and beneficial to the skin. Its critics complain that it may cake on the skin and undergo bacterial decomposition.

The incorporation of 3 to 5% zinc or magnesium stearate improves the water-repellent properties of the powder and this helps to prevent urine scald. Lithium stearate has been recommended as a replacement for zinc stearate. Olive oil may be added to talc in place of zinc stearate to improve adherence and emollience on the skin and to impart greater water repellency to the powder.

Zinc oxide may be added for the many special properties it imparts. These include superior adherence, opacity to burning rays of the sun, bacteriostatic action, mild astringency, deodorisation by neutralisation of perspiration odours, together with soothing and protective properties.

Colloidal kaolin has been used in baby powders for its high moisture adsorptive capacity. It imparts greater adherence to the skin than

does talc, it spreads easily and it has a relatively high density.

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Acetylvert L.G., Givaudan	5
Musk ketone	3
Vanillin	2
Versalide	2
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LITERATURE

- Anon., "Toiletries for the Baby," Schimmel Briefs, No. 139, Oct. 1946.
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FERTILISERS and Plant Nutrients

By D. P. Hopkins, B.Sc., F.R.I.C.

Urea • Seed damage • Seedbed nitrogen • Potash and bulbs • Grassland fertilisers • Availability of soil nutrients • Phosphoric acid • New processes

More about urea

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This trend of lower efficiency could not be correlated with type of soil, with the sward's botanical composition or with the percentage of biuret in the urea used.

The second paper² has tackled these urea problems with laboratory and pot tests. There are clearly distinct causes of possible inefficiency. The biuret impurity factor is only significant when urea is applied in contact with germinating seeds; then as little as 1.3 lb. per acre of biuret can have phytotoxic effects. With, say, 2.5% of biuret in commercial urea, this amount for damage-risk to seeds would be given in a dressing of urea of about 56 lb. per acre. The biuret risk appears to be insignificant when urea is used as a top dressing; up to 150 lb. per acre dressings may be safely given and even with up to 5% of biuret in urea there is no adverse effect upon urea's ammonification or nitrification in soil. However, urea free from biuret can still be phytotoxic to seeds—this seems to be caused by rapid formation of ammonia.

Small-scale tests confirmed the view that loss of nitrogen to the air is the cause of occasional inefficiency of urea as a top dressing. If urea is mixed with acid salts, it is much less likely to lose nitrogen to the atmosphere or to have adverse effects on germinating seeds through rapid ammonification.

Urea damage to seeds

This question of urea's potentially damaging effect upon seeds is highly important, for in this country some manufacturers are using urea as a concentrated nitrogen source for compounds. Clearly, when urea is

mixed with superphosphate or monoammonium phosphate, its ammonia-forming danger to seeds is prevented. However, that does not dispose of the danger from biuret. It is at present a manufacturing fact that high proportions of urea in compounds cannot be formulated without causing difficulties to the granulation process; 10% of urea in a mixture would seem to be about the limit. This means that any compound in which urea has been used is unlikely to contain more than 2 cwt. of urea per ton. A cereal seedbed combined dressing is unlikely to exceed 5 cwt. per acre in rate, which would mean at the most an application of 56 lb. of urea per acre. With urea containing up to 2.5% of biuret this would be close to the threshold figure for phytotoxic damage to germinating seedlings. However, urea—including NPK compounds are likely to be concentrated NPK fertilisers and most seedbed dressings for cereals would be appreciably under the 5 cwt. rate; 3 cwt. would be more common. The risk would seem a small one provided that urea does not contain more than 2.5% of biuret as impurity. (It should be made clear that this paragraph is based upon deductions from the paper above and that this particular discussion is not attempted in the paper itself.)

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foundation creams and for all-purpose creams may be modified to produce perfectly satisfactory baby creams. The manufacture of baby creams is the same as for adult creams. They may be o/w or w/o emulsions. The nonionic, nonionic-cationic emulsions offer the advantage of permitting formulation at skin pH values. Cationic ammonium, pyridinium and morpholinium compounds may be added at concentrations of 0.1 to 0.25% to those formulae which do not contain free fatty acids.

The concentration of perfume is usually 0.1%.

Baby powders

Baby powder is one of the biggest of all sellers in this market. Baby powders are similar in composition to other toilet powders, except that they may contain an antiseptic ingredient and are not so highly perfumed. In addition, they must resist urine and neutralise its odour.

Baby powders are used principally as lubricants in skin folds, to prevent chafing, to absorb perspiration and relieve prickly heat, and to impart a clean, pleasant fragrance to the skin.

Talc is the main constituent of baby powders. The starches, especially corn starch, are also used in place of talc. Its proponents claim that it does not dust as freely as talc, it is a good absorbent and beneficial to the skin. Its critics complain that it may cake on the skin and undergo bacterial decomposition.

The incorporation of 3 to 5% zinc or magnesium stearate improves the water-repellent properties of the powder and this helps to prevent urine scald. Lithium stearate has been recommended as a replacement for zinc stearate. Olive oil may be added to talc in place of zinc stearate to improve adherence and emollience on the skin and to impart greater water repellency to the powder.

Zinc oxide may be added for the many special properties it imparts. These include superior adherence, opacity to burning rays of the sun, bacteriostatic action, mild astringency, deodorisation by neutralisation of perspiration odours, together with soothing and protective properties.

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dressings of N; responses to these later top dressings seemed largely independent of seedbed-applied N. Thus, 1½ cwt. of a nitrogen fertiliser given to the winter seedbed led to an average extra yield of 5 cwt. of grain and another 1½ cwt. given in the spring led to a further gain of 5 cwt. An outlay on fertiliser costing about £2 thus led to 10 extra cwt. of crop product worth £13-14.

Potash and bulbs

A variety of fertiliser tests results has come from a Cornish N.A.S. horticultural crop centre.⁴ Bulb flower crops are in their seventh year of potash trials; plots compared for five levels of potash—from nil to 6 cwt. an acre of sulphate of potash—have shown better growth and bulb increases where potash is given, with these effects greatest for the higher rates of potash dressing. With winter cauliflowers, dunned plots were at first more vigorous, but this advantage faded and highest final yields were given by plots receiving phosphate and potash fertilisers in the seedbed. Nitrogen also gave high yields, but many of the heads were below desirable market size. In contrast, other tests showed the high importance of nitrogen top dressings for spring cabbage, as much as 7 cwt. an acre of sulphate of ammonia split into two dressings, January and March, being desirable for large yields. Many other fertiliser-vegetable relationships are to be found in this report.

Fertilisers for grassland

Other experimental work of N.A.S. origin has questioned the superiority of re-seeding permanent pasture and converting it to leys as grassland farm policy.⁵ On the basis of earlier work—which compared results of the two systems on the same large grassland area and which showed economic advantage in milk costs for the permanent pasture—two new and similar experiments on inherently less fertile land showed in one case roughly equivalent economics and in the other the financial advantage still remained with the permanent pasture. But the important consideration in this work is that the area of grass left permanent was in all cases given the same level of fertiliser treatment as the comparable area ploughed and re-seeded. The familiar argument that temporary pasture is more productive is perhaps based more than is generally realised upon the fact that

almost invariably the new grass receives better fertiliser treatment than permanent pasture. This disparity between ley and permanent grass is only too starkly revealed in all surveys of grassland fertiliser practice. Often, therefore, it may be cheaper to give permanent pasture better fertiliser treatment (and afterwards better management) than to plough and reseed it.

Phosphate and grass

An important paper, belatedly seen by this reporter, has once again shown that older conclusions about fertiliser effects require modification under our modern conditions of high rates of application.⁶ A considerable amount of former grassland work has shown that responses of all-grass or low-clover-content swards to phosphate dressings are small, but most of this work was done when much smaller rates of nitrogen were given to grassland. With heavy nitrogen feeding a re-seeded pasture at Wye became an all-grass sward in its third year. With continued heavy N feeding common to both plots, the effects of no phosphate and 5 cwt. of superphosphate were compared. *The superphosphate treatment raised dry matter output by 30%.* The effect is directly due to the phosphate and is not attributable to the sulphur or calcium content of the fertiliser; for the plot soil was high in calcium, pH 7.7, and sulphate of potash did not produce similar effects. With the contemporary trend among some advisers to reduce phosphate rates or to regard regularity of phosphate dressings as less important, the indications of this paper deserve much consideration.

Soil nutrient availability

The relationship between soil pH and soil nutrient availability is fairly well established, and has been for at least 25 years, so far as mineral and mainly mineral soils are concerned. The matter is more obscure for soils which are predominantly (over 50% or more) composed of organic matter. Now better light has been shed by studies of organic soils at Michigan State University.⁷ The paper provides a diagrammatic chart, like the well-known Pettinger-Truog chart for mineral soils, giving availability "bands" which are widest for highest availability and which cross pH co-ordinates from 4 to 9. The bands apply to 12 nutrients, N, P, K, S, Ca, Mg, Fe, Mn, B, Cu, Zn and Mo. The ideal pH for optimal

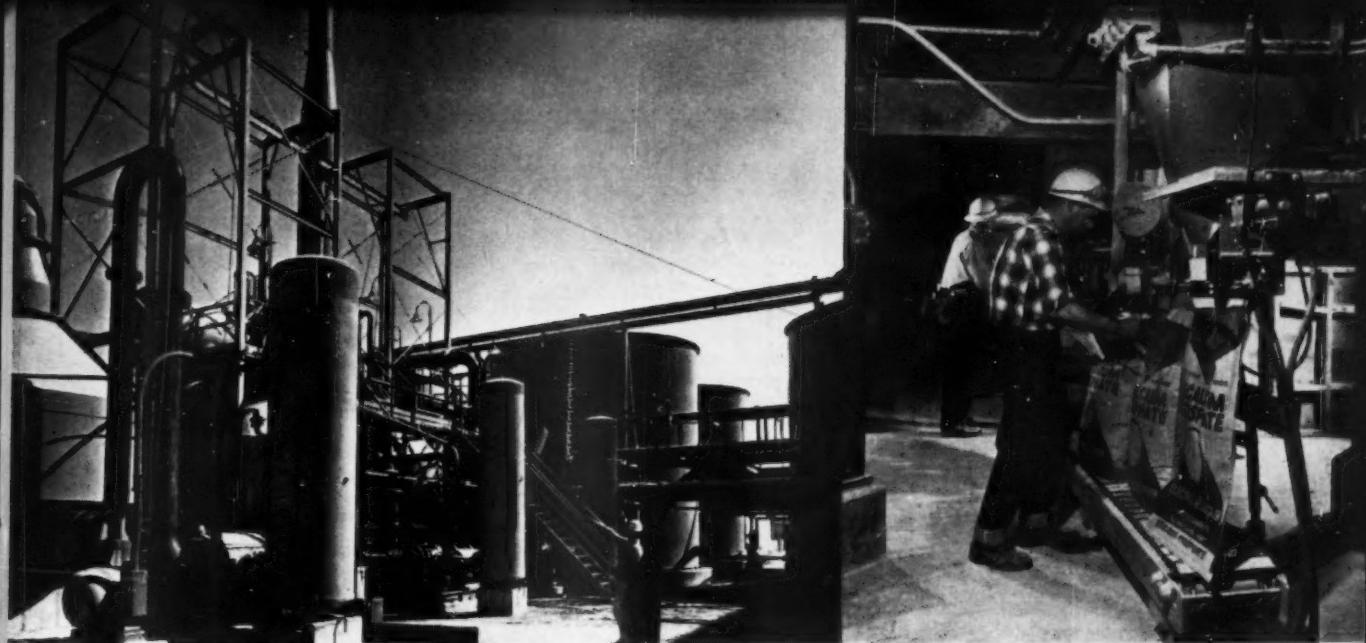
availability of all 12 lies between 5.5 to 5.8 for woodland organic soils, and is 5 for sphagnum peat soils. Liming organic soils above pH 5.8 is undesirable as it reduces P, Mn, B and Zn availability. A warning about applying these findings to British conditions: the U.S. pH values were measured by obtaining a slurry of soil and distilled water; here it is often more usual to use a suspension of soil in *N*-KCl solution, a method that would give lower pH values.

Phosphoric acid

Phosphoric acid is increasingly used in making compound fertilisers, notably in America. The more common method of producing the acid is the wet process, but wet-process acid is considerably more difficult to handle than furnace phosphoric acid because of its tendency to form sludge deposits. This defect has been aggravated by the fast growth in demand for high-analysis liquid fertilisers in U.S.A. Though phosphoric acid is a natural choice as a P-source for liquid products, deposits will block spray nozzles and even clog pipelines. A U.S.D.A. paper⁸ has shown that sludge formation in wet-process acid is principally due to acid-soluble organic matter, fluosilicate and aluminiferous clay phosphate. Sludge formation is avoidable if the acid is neutralised with phosphate rock; this precipitates calcium fluosilicate which is removable by filtering; the calcium can be removed from the resulting aqueous calcium phosphate solution as sulphate. The aqueous solution of superphosphate arising as an intermediate can be used as a starting point for manufacturing more wet-process phosphoric acid. The paper also discusses the relationship between sludge formation and the composition of the originally-used phosphate rock.

Another approach to the same problem with liquid fertilisers based upon wet-process acid is presented in a TVA paper.⁹ The impurities in the acid which precipitate after ammoniation can be kept in suspension by adding 1 to 2% by weight of a swelling-type clay; or by ammoniating to a pH of 7 or higher and subsequently adjusting the liquid fertiliser's pH to 6.7 before storing. Another "solid" trouble in such liquid fertilisers is the growth of magnesium ammonium phosphate crystals; these can become large enough to block nozzles. This can

(Continued on page 554)



Left: Plant for the concentration of phosphoric acid with tank storage farm shown in the background. Right: Dicalcium phosphate being bag loaded at the plant. DCP, a mineral supplement for stock feeding, is also delivered in bulk.

New Fertiliser and Feed Phosphates Plant

THE Electric Reduction Co. of Canada Ltd.—a member of the Albright and Wilson Group—have started production at their new multi-million dollar plant at Port Maitland, Ontario. Initial production consists of normal and triple superphosphates, phosphoric acid and liquid phosphatics for use in fertilisers; and dicalcium phosphates for animal feed.

The new plant makes the company one of the few producers of phosphatic fertilisers in an area at present consuming 750,000 tons each year, most of which was previously imported. The relatively high capacity of the Port Maitland plant places the company in a strong selling position. Up to 500,000 tons of phosphate rock will be transported by rail to the site each year. Another advantage of the plant is its extensive storage facilities which allow up to 50,000 tons of superphosphates alone to be held in stock.

A promising outlet for the production of the new plant is the animal food business, since about 30,000 tons of

phosphates are imported into Canada each year for this purpose. Dicalcium phosphate, though competing with defluorinated phosphate rock and Curaçao rock, provides the most available form of inorganic phosphorus for livestock food and should account for a major portion of the market.

The United States market is rich in potential and an entry has been facilitated by an agreement with International Minerals and Chemicals which provides for IMC handling ERCO material in return for supplying phosphate rock. It is anticipated that at least 25,000 tons of P_2O_5 in the form of high-analysis phosphates will be directed to the North Central United States.

The integrated nature of the Port Maitland operations enables ERCO to alter its product mix to suit market conditions. Its proximity to the markets for industrial phosphates as well as the agricultural markets of Ontario and Northern United States makes the location ideal for the company's future expansion programme.



Action floor under which reaction of sulphuric acid and phosphate rock takes place.



The Port Maitland plant has covered storage for up to 50,000 tons of superphosphates.

be obviated by ammoniating to a pH of 6, but this conflicts with the pH requirement for keeping other deposits in suspension. Fortunately, another method of preventing magnesium ammonium phosphate crystal growth is rapid cooling to room temperature after liquid fertiliser manufacture. A third paper¹⁰ on wet-process phosphoric acid deals with its use in making granular compound fertilisers, which commenced in U.S.A. in 1955 and has for economic reasons expanded considerably since. This paper discusses the equipment requirements for minimising the main defects of wet-process acid—high viscosity, highly corrosive nature and content of impurities. Details are given of materials used for corrosion-resistant tanks and pits and of the best suited types of flowmeters.

Processing

What is called a "self-granulation" process for the ammoniation of superphosphate process is covered by a recent U.S. patent.¹¹ Superphosphate is continuously fed into a mixing section at a rate capable of maintaining a vapour seal at the exit. In the next chamber anhydrous ammonia is fed by a sparger at a rate producing equi-molar amounts of NH₃ and mono-Ca phosphate. This mixture reaches a third chamber as a hot and moist solid, but here evaporation conditions are fostered by an exhaust fan system. As a result crystallisation of ammonium phosphate proceeds at a progressive rate as the bed of material moves forward and the material at the final outlet point is claimed to be granular. The patent covers also the use of a potassic addition.

A paper¹² dealing with the design of void spray towers to absorb silicon tetrafluoride in gaseous effluents from superphosphate manufacture reports experimental work carried out on the gas scrubbing unit of a Broadfield den. The variables of tower height, liquor recirculation rates and concentration of circulating liquor were studied, and also the effects of counter-current or co-current absorption.

REFERENCES

1. W. G. Templeman, *J. Agric. Sci.*, 1961, **57**, 237.
2. A. J. Low and F. J. Piper, *J. Agric. Sci.*, 1961, **57**, 249.
3. "Farming at High Mowthorpe," 1961, N.A.S. Rept., 14.
4. Rosewarne Exp. Hort. Sta. 1960 Rept., N.A.S., 1961.
5. A. J. Davies, *Exp. Husbandry Farms Progress Rept.*, 1961, 1.
6. J. L. Wheeler, *J. Brit. Grassland Soc.*, 1960, **15**, 300.
7. R. E. Lucas and J. F. Davis, *Soil Sci.*, 1961, **92**, 177.
8. E. J. Fox and W. A. Jackson, *J. Agric. & Food Chem.*, 1961, **9**, 334.
9. A. V. Slack and M. C. Nason, *J. Agric. & Food Chem.*, 1961, **9**, 343.
10. D. O. Walstad, *J. Agric. & Food Chem.*, 1961, **9**, 348.
11. J. E. Seymour, U.S. Pat. No. 2,976,126, 1961.
12. A. C. Calver and J. D. C. Kemsley, *Fert. Soc. Proc.* No. 63, 1961.

DETERGENTS and Surface Active Agents

By Leon Raphael, M.Sc., F.R.I.C.

Measured detergents • Formulation of bubble baths • Dodecyl benzene sulphonate • Production of alpha-olefines • Analytical advances • Synergism • A new synthesis of sucrose esters • How CMC suspends soil • Efficiency of detergents • Quaternaries and amphoteric • Iodophors • Ethylene oxide-phenol reaction

IN SPITE of the continued success of synthetic detergents and the vast volume of advertising designed to push sales still higher, consumption in Britain lags behind that in the U.S. In 1948 syndets had only 14% of the U.S. market for soap and detergents; today they hold 76% of the market. The market too has expanded, *per capita* consumption now standing at 27 lb. p.a.¹

In Britain only 40% of the total market of 1,300 million lb. is held by syndets. France seems to have a slightly better liking for syndets, which possess about half the market.² On the other hand, the market is smaller than Britain's, amounting to 800 million lb.

Liquid detergents are getting more popular both in America and Europe.

Measured detergents

To educate the housewife to use the right amount of detergent in the wash, in the U.S. products are now being sold in measured amounts either as readily soluble tablets or in soluble envelopes. The big three, Proctor and Gamble with 50% of the market, Lever Brothers with 20% and Colgate Palmolive with 10%, have all started this new approach and are test-selling in various towns.³

5. A. J. Davies, *Exp. Husbandry Farms Progress Rept.*, 1961, 1.
6. J. L. Wheeler, *J. Brit. Grassland Soc.*, 1960, **15**, 300.
7. R. E. Lucas and J. F. Davis, *Soil Sci.*, 1961, **92**, 177.
8. E. J. Fox and W. A. Jackson, *J. Agric. & Food Chem.*, 1961, **9**, 334.
9. A. V. Slack and M. C. Nason, *J. Agric. & Food Chem.*, 1961, **9**, 343.
10. D. O. Walstad, *J. Agric. & Food Chem.*, 1961, **9**, 348.
11. J. E. Seymour, U.S. Pat. No. 2,976,126, 1961.
12. A. C. Calver and J. D. C. Kemsley, *Fert. Soc. Proc.* No. 63, 1961.

Bubble-baths

Recently bubble-baths have gained popularity. A bubble-bath can be produced with 0.005% to 0.01% syndet in 50 gal. of water. Of importance in hard-water areas is the ability to remove the scum or bath-tub ring. The lower surface tension of the water will help the bather to dry off quickly. The syndet must form copious foam.

Among the detergents used are fatty alcohol sulphates, alkyl-aryl-sulphonates, amine condensates, diethylsulphosuccinates and polyglycol ether sulphates. Triethanolamine dodecyl benzene sulphonate can be made available in 60% concentration. The products are often mixed to give a synergistic effect. Diethylsulphosuccinates are powerful wetting agents, but poor foamers. They can be fortified with amine condensates or polyglycol ether sulphates. Ethyl alcohol is widely used as a solvent for these products, and more recently hexylene glycol has been used. A foam should not be too stable, but should collapse by the time the bath water is finished. Capsules in soluble envelopes have found a ready use in this field.

It is estimated that Americans spend 8 million dollars a year on bubble-baths.⁴

Heavy duty liquids

While light-duty liquid detergents based on nonionics have been quite satisfactory, the trend towards heavy-duty liquids has been increasing. Dodecyl benzene sulphonate is still the biggest raw material in detergent manufacture and is used in heavy duty liquids. The neutralisation of the sulphonic acid has been the subject of a recent

investigation.¹ Caustic soda, caustic potash, ammonia, triethanolamine and morpholine are all possible neutralising agents. These different alkalis affect certain physical characteristics of the final product. The cloud-point can vary from 5° to -10°C. This is important in the formulation of liquid detergents, since a lower cloud-point involves the addition of a solubilising agent such as alcohol or urea. In this respect caustic soda is the worst neutralising agent, giving a high cloud-point to the product, although it is the cheapest alkali. A mixture of caustic soda and triethanolamine produces sulphonates clouding below 0°C., lower than that produced by either neutraliser alone. Foam stability and foam height are also affected by the choice of alkali. Caustic soda or a mixture of NaOH and ammonia are preferred. NaOH and TEA mixture is by far the most efficient to produce good wetting properties, but is rather expensive to use. The most suitable mixture to give an efficient product without incurring increased production cost is 3 parts of NaOH to 1 part of ammonia.

Alpha-olefines

Proctor and Gamble have utilised a Ziegler process for production of α -olefines, the alkylating agent of benzene, to give alkylarylsulphonates with a narrow range of molecular weight.⁵ Ethylene is reacted with aluminium triethyl to give an aluminium alkyl of high molecular weight. This in turn reacts with ethylene to give α -olefines, regenerating the aluminium triethyl which can be recycled. The addition is random, giving a range of polymers with a Poisson distribution, containing molecules ranging from C₆ to C₁₈. Aluminium triethyl and the lower olefines C₆-C₁₄ are removed as overheads from wiped-film evaporators. The C₁₆-C₁₈ olefines are distilled from the residue. The overhead stream of lower olefines is treated with "chlorex" which takes off the C₆-C₁₀ fraction. The residue is distilled to give the C₁₂-C₁₄ fraction.

Colorimetric determination of ABS

New analytical methods are always being sought for detergent mixtures. This is particularly important in controlling the detergent content of sewage. A colorimetric method has recently been devised to

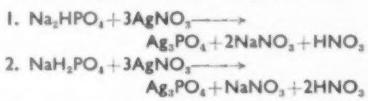
determine alkyl benzene sulphonates, using methylene blue.⁶ Oxidisable impurities tend to interfere and must be removed by chromic acid. The latter does not attack alkyl benzene sulphonates in the cold. The excess chromic acid is reduced by ethanol at low temperature and the solution is then boiled with concentrated sulphuric acid to hydrolyse organic sulphates and phosphates. The A.B.S. is then extracted with a solution of methylene blue in chloroform, the colour intensity of the complex being measured on a spectrophotometer at 6,250 Å. This method claims to measure A.B.S. to 0.5 p.p.m.

Sulphate in mixtures

Inorganic sulphate in detergent mixtures is usually estimated as BaSO₄, after extracting organic matter with alcohol or acetone/ether. Triethanolamine invalidates this method and some alkyl ether sulphates are insoluble in acetone/ether mixtures. If extraction is incomplete, the BaSO₄ is solubilised by the surfactant present. An improved method is to bind the anionic detergent with methyl pyridinium bromide, frequently used in its determination. This is followed by precipitation with standard barium chloride solution and HCl. The excess barium is titrated with E.D.T.A.⁷ (after neutralising with ammonia).

Phosphates

Phosphates can be determined in detergent mixtures with silver nitrate according to the following reactions:



Reaction 1 takes place at pH 9.2 and reaction 2 at pH 4.5. The condensed phosphates usually present in detergent mixtures break down to simple phosphates like those above, on hydrolysis. This can be carried out with nitric acid and the pH adjusted to 4.5. Silver nitrate is then added and the acid produced by the reaction is titrated with standard alkali. A separate determination is carried out, adjusting the pH to 3 after hydrolysis and titrating with a standard alkali following the pH change. The point of greatest slope corresponds to the pH where phosphate is present in the diacid form. The solution is then adjusted to this pH, silver nitrate is added and the

solution titrated to pH 9.2 with standard alkali. The ratio of the two titrations gives the chain length of the condensed phosphate present.

Synergistic effects

Synergism is the enhancement of properties observed when two surfactants are mixed, the performance of the mixture being superior to either surfactant alone. The mixing of nonionics and anionics has been known to produce a product with improved foaming power and stability. It has been suggested that synergism results from a lowering of the critical micelle concentration. Concentrated detergent solutions are anisotropic⁸ or liquid crystalline, and synergism results in closer packing, increasing the anisotropy. This effect was studied in connection with sucrose esters, which are nonionic surfactants. Anisotropy of these solutions was followed with a polarising microscope and the foaming and detergent properties were compared. The anisotropy of an anionic solution was enhanced by addition of a sucrose ester, while polyglycol esters, tall oil/ethylene oxide derivatives and mineral oil remove the anisotropy. Likewise, the detergency and foaming power of such a solution was enhanced by the addition of sucrose esters.

Sucrose esters

The sucrose esters are used as emulsifiers in cosmetic preparations as they do not degrease or irritate the skin. Their HLB values are in the range required to emulsify the constituents. Unlike other nonionics they do not affect biologically active ingredients such as *p*-hydroxy benzoic acid, so that stability is preserved.

A new synthesis for sucrose esters has been developed in Italy,⁹ the products having the highest degree of purity yet attained. One of the difficulties involved in the existing process of esterification is the complete removal of the reaction solvent methyl formamide. The Italian process starts from natural fats rather than fatty acids and sucro-glycerides are produced simultaneously with the sucrose esters. The latter are solids or waxes melting in the range 80°C. to 130°C. The sucro-glycerides are softer. With the exception of sucrose monolaurate, the sucrose esters and sucro-glycerides are insoluble in water, but dispersible. When such a dispersion is heated a gel is formed. The two products can be used in combination for emulsification in

lotions or creams up to 4% of the composition.

Glycerides, the glycerol esters of fatty acids are widely used as emulsifiers. Commercially available glycerides are usually mixtures of mono- and diglycerides, the latter predominating. A monoglyceride content of 30 to 50% can be produced by the right choice of conditions. The development of large-scale molecular distillation has led to the industrial production of monoglycerides of 95% monoester content.¹⁰ A monoglyceride of low iodine-value containing only traces of unsaturated fatty esters has been developed from the hydrogenation of lard, melting at 68°C. A monoester containing about 50% unsaturates melts at 45°C., while a totally unsaturated monoester is liquid at ambient temperatures. In general, however, the monoglycerides have higher melting-points than their corresponding triglycerides. They are relatively insoluble even in mineral oil. Recently, 2-3% monoglyceride has been incorporated into peanut butter to prevent its separation at extremes of climate. A mono-diglyceride mixture with three times its weight of water forms a gel, insoluble in water but soluble in mineral oil. Using aqueous solutions of inorganic salts to prepare the gel, a clear solution of the salts in oil can thus be prepared. Such solutions may find application in pharmaceutical preparations. Another application of monoglycerides is their complexing properties applied to starch for incorporation in food-stuffs, so preventing the polymerisation of amylose, the cause of stalting.

How CMC suspends soil

Carboxymethylcellulose is well known as a soil suspending agent and as such is incorporated in detergent formulations. Various theories have been put forward to suggest the mechanism of this action and conflicting views have been presented as to whether the CMC is adsorbed on the fibre or on the soil particles. A recent German paper¹¹ states that both types of adsorption occur and are in fact in competition. The relation between the soil suspending property and the physical characteristics of the CMC is however more complicated. Carboxy methyl cellulose, like all polymers, contains a distribution of molecular weight and, in addition, different degrees of substitution. This latter property affects the balance of hydrophilic

and hydrophobic properties, the more hydrophilic molecules being more water-soluble, forming solutions of lower viscosity, while the more hydrophobic molecules will swell greatly, forming gels in water and producing highly viscous solutions.

Because of the distribution of polymers in CMC, both sol and gel phases will be present in a solution; the degree of swelling or the viscosity of the solutions will vary according to the nature of the CMC. In a series of experiments it was observed that a low-swelling CMC was the most efficient in soil suspending properties and in addition a low degree of polymerisation, preferably between 200 and 900, was required. The gel phase inhibits soil suspension, so that the separation of the phases by centrifuging produced a highly efficient sol phase. By mixing low- and high-swelling CMCs in equal proportions the efficiency of the low-swelling CMC was reduced to about half and approached that of the high-swelling product. The addition of electrolytes to a solution increased the gel content which was coagulated by alcohol. Separation of this gel on the centrifuge left a sol which was less efficient than that separated directly without additions of salts. The sol phase contains the microgel form or micelles, which are balanced between hydrophobic and hydrophilic properties. It is these micelles which are the adsorbents in detergent operations.

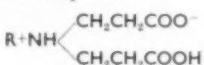
Detergent efficiency

Efficiency of detergents has been frequently measured by tagging with radioactive isotopes. This can be done in tristearin or triolein with C¹⁴. Nonionics based on ethylene oxide can be tailor-made with different ratios of hydrophilic (ethylene oxide) chain to hydrophobic (alkyl phenol) group. An alkyl phenol with about 10 moles ethylene oxide was found to be the most efficient detergent. Anionics varied with conditions of pH, the two extremes of 3.5 and 11 being most suitable.¹² Nonionics have the peculiar property of coming out of solution at high temperatures. This "cloud-point" increases with increasing ethylene oxide content and it is at this temperature that detergency operates at its optimum. Octyl phenol with 10 ethylene oxide moles per mole hydrophobe has a cloud-point around 80-85°C. Alkyl benzene sul-

phonates also vary with molecular composition. The pentadecyl benzene sulphonate is superior to other A.A.S.

QAs and amphoteric

Quaternaries and amphoteric are among the least used detergents.¹³ While they show certain similarities their functions and behaviour vary widely. They are both nitrogen based and are salts forming monomolecular films. The quaternaries dissociate into a large cation and a small anion. Amphoteric contain both charges on the molecule as their name implies.



They are prepared by condensation of a fatty amine and an α - β unsaturated monomer, or from chloroacetic acid with a fatty imidazoline. They are soluble over a wide range of pH, and perform in both acid and alkaline solution with different properties. They adsorb on many surfaces, being highly substantive to cellulosic films, clay, glass, rayon and general hydrophilic substrates. They are used in textile softening, preventing the build-up of static electricity. They improve the handling, lubricity and rewetting properties. They reduce yellowing and are toxic to micro-organisms. The quaternaries have had wide acceptance in the U.S. as softeners in textiles and in laundering. They resist mildew and are therefore used in textile processing as an auxiliary softener together with finishing agents. They are also used as preservatives in cosmetic preparations and detergent sanitisers. The development of amphoteric has been slow in industry. They have been used in cosmetics and shampoos, heavy-duty alkaline cleaners and as freeze-thaw stabilisers for latex-paints. More recently they have been used in emulsion polymerisation.

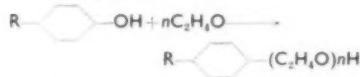
Iodophors

Pluronics are being used as carriers of iodine—iodophors.¹⁴ Up to 28% iodine can be incorporated to produce a detergent sanitiser. Not all the iodine solubilised is available as free titratable iodine. A portion is complexed with the nonionic. It is therefore advisable to have a high concentration of available iodine. Polyvinyl pyrrolidone is widely used as an iodophor. The resulting complex gives stable aqueous solutions, al-

though part of the iodine is reduced to iodide and a small amount is organically bound. It has been postulated as an interstitial compound. Other possible iodophors are carboxy methylcellulose and the quaternaries. The iodophor complexes are effective at low temperatures and at low concentrations. They have been used widely with no irritant effects on eyes or skin. Their applications include germicidal soaps, toothpaste and mouth-washes. The cationic iodophors are used in surgical scrubs to degrease the skin and have been suggested as sterilisers in the treatment of paper and fabrics as well as for human and animal hair. The PVP-iodophor may be employed in ointments and creams for skin applications, and in shampoos for seborrhoeic dermatitis of the scalp.

Ethylene oxide-phenol reaction

The reaction of ethylene oxide with alkylated phenols produces the well-known nonionic surfactants of the type sold in this country under the name of *Lissapol N*. The reaction can be expressed as



The final product has an average value for molecular weight, but adducts with different n values exist over a wide range, the largest proportion however corresponding to the average value. The distribution varies with reaction conditions. Flory (*J.A.C.S.*, 1940) showed that the polymers followed a Poisson distribution and described a method of calculating it. It has been shown that each alkyl phenol mole reacts with one ethylene oxide mole in the first stage of the reaction and this then forms the initial step in the chain, so that before any further additions ($n > 1$) can take place, all the alkyl phenol has been oxyethylated.

A recent paper¹⁵ has described the reaction of ethylene oxide with dinonyl phenol, and in this case the molecular weight does not follow the distribution calculated by Flory, but is somewhat wider. Using chromatographic data, it was shown that "chaining" begins before all the phenol moles are mono-oxyethylated. The dinonyl phenol was synthesised by BF_3 catalysed reaction of propylene trimer with phenol. The distilled product was reacted with ethylene oxide using an alkali catalyst.

An adduct with an average n value of 1.03 designated $\text{DNPE}_{1.03}$, and one designated $\text{DNPE}_{9.15}$ on the same basis, were studied. The solution of $\text{DNPE}_{1.03}$ in benzene was charged into a column packed with silicic acid. The fractions eluted were evaporated in dry nitrogen. Counter-current extractions on $\text{DNPE}_{9.15}$ were carried out using a series of solvents, the eluted samples being observed spectrophotometrically at 2,760 Å.

The $\text{DNPE}_{1.03}$ contained 15% unreacted phenol, 61% mono-oxyethanol and 18% oxyethylated phenol with $n > 1$. The unreacted DNP was found by infra-red examination to be mainly 2,4-DNP with very little 2,6-DNP. It was not made clear which isomer predominated in the oxyethylated product. Steric hindrance due to the occupation of the *ortho*-position would apply in both 2,4 and 2,6 isomers.

REFERENCES

1. *Soap*, 1961, **37**, (7), 37.
2. *Chem. Prod.*, 1961, **24**, (9), 365.
3. *Chem. Week*, 1961, Sept. 16, 51.
4. *Amer. Perf.*, 1961, **76**, (7), 17.
5. *Chem. Eng. News*, 1961, **39**, (38), 81.
6. *ibid.*, 1961, **39**, (37), 75.
7. *Anal. Chim. Acta*, 1961, **24**, (3), 205, 219.
8. *J.A.O.C.S.*, 1961, **38**, (4), 184.
9. *Drug & Cos. Ind.*, 1961, **89**, (1), 34.
10. *Rev. Franc. Corps Gras*, 1961, **8**, (2), 65.
11. *Fette Seifen Anstrich.*, 1960, **62**, (12), 1123.
12. *J.A.O.C.S.*, 1961, **38**, (3), 123.
13. *Soap*, 1961, **37**, (4), 61.
14. *Amer. Perf.*, 1961, **76**, (5), 44.
15. *J.A.O.C.S.*, 1961, **38**, (6), 289.

WYETH'S LABORATORIES

(Continued from page 546)

Very great care has to be taken to try to keep infection out of the animal rooms where these tests are being performed, and strict attention has to be paid to the diet and environmental conditions of the experimental animals.

The most important services provided in the new unit are those controlling the air conditioning and ventilation requirements (Harcold Refrigeration Co. Ltd). The air conditioning plant is designed to maintain a temperature of not less than 65°F. DB and not more than 70°F. DB with 50% to 60% relative humidity, and gives within the laboratories and animal rooms 9 to 13 air changes per hr. There is no recirculation of air and the roof construction is designed to minimise heat gains in summer.

The ventilation plant gives 10 air changes per hour to the dog kennels and food and bedding stores.

Chemicals in the Commons

Drug Promotion Costs

THE Minister of Health was asked what action he was taking to obtain fuller information about production costs, profit margins and sales promotion costs of pharmaceutical manufacturers, in the light of the third report of the Committee on Public Accounts.

Mr. Enoch Powell replied that the industry had been asked for further information on sales promotion costs. Inquiries into costs and profits of a number of firms were being made under the revised voluntary price regulation scheme.

Anti-smoking pills. Pointing out that a number of National Health Service doctors were prescribing an anti-smoking product called *Lobidan*, costing £5 16s. 8d. for 120 tablets, Mr. Martin Lindsay (Conservative, Solihull) called on the Minister to stop this. Mr. Powell said it was for the individual doctor to prescribe what drug he thought right for a particular patient; but he might be called on to justify it.

Polio vaccine. The Minister said he had received these recommendations from the Joint Committee on Poliomyelitis Vaccine:

(1) Sabin vaccine might be used both safely and effectively for primary vaccinations; (2) Pending further study, Sabin vaccine should not be used to complete a course of vaccination started with Salk; (3) So long as Salk vaccine was available, it should also be provided for primary vaccinations if preferred.

Mr. Powell said the Government had accepted these recommendations and Sabin vaccine would be made available to local health authorities and doctors for routine vaccination.

Cheap drugs. Questioned about his action to get cheaper drugs from abroad, the Minister said that contracts had been placed for the supply of five drugs (tetracycline, chloramphenicol, chlorothiazide, oxytetracycline and chlortetracycline) for the hospital service, at an estimated total saving, before payment of royalties, of about £500,000 in a full year.

The Minister said there was no question about the quality of the articles which were being obtained at advantageous prices. In due course royalties would either be negotiated or adjudicated.

Book Reviews

Partition of Cell Particles and Macromolecules

By Per-Ake Albertsson. Wiley, London, 1961. Pp. 231. 56s. net.

THE isolation of subcellular particles from disrupted cells is becoming of increasing importance in biochemistry for the study of the fundamental problem of the relation between structure and function in the living cell. Hitherto centrifugation has been the most frequently used method, chiefly because it is well understood and because adequate centrifuges are commercially available. Differential centrifugation and density gradient centrifugation are two versions of the basic method.

At the Institute of Biochemistry in Uppsala, Sweden, a good deal of work on separation methods has been done. In this book, one of the Uppsala workers describes the fractionation of macromolecules and cell particles by distribution in liquid-liquid two-phase systems. By this method particles are separated mainly by difference in their surface properties.

In a preface, Prof. Arne Tiselius commends the method as simple and offering great possibilities. It is being developed at Uppsala and elsewhere. This book will intensify world interest in the method.

Industry and Careers

Ed. D. E. Wheatley. Iliffe Books Ltd., London. Pp. 776. 55s. net.

THE emphasis on industry, apparent in the title of this book, is borne out in its pages. There is a full description of each industry: its size, location, organisation and managerial structure; the materials, techniques and plant it uses, and its attitude towards research; its personnel at every level, their work and their skills. The prospective employee is thus given a comprehensive guide to every facet of each industry including, of course, the pharmaceutical industry, so that he may judge from this book whether his inclinations and qualifications suit him to a particular career. The book also considers what qualifications are necessary and how they can be obtained.

One unusual feature is the final section of advertisements by leading companies and another is the use of

coloured charts to clarify systems of organisation, paths of promotion and the sequence of operations in industrial processes. The Foreword has been written by H.R.H. the Duke of Edinburgh.

Industry and Careers is a useful study of British industry and a valuable guide to those choosing a career.

Poisons and T.S.A. Guide

6th Edn. Published by the Pharmaceutical Society. Pharmaceutical Press, London, 1961. Pp. 78. 7s. 6d. net.

THIS well-known guide for pharmacists in retail and hospital practice gives full information on the Pharmacy and Poisons Act, 1933, and Poisons Rules. As usual there is an alphabetical index to all the substances concerned to facilitate the checking of their status. In this edition the information has been extended to include the requirements of the D.D.A. 1951, the regulations made under that act, and the Therapeutic Substances Act, 1956, as far as it concerns the supply and dispensing of antibiotics and other therapeutic substances controlled by that legislation.

The Actinomycetes

Vol. II: Classification, Identification and Descriptions of Genera and Species. By Selman A. Waksman. Baillière, Tindall and Cox, London. 1961. Pp. 363. £6 net.

THE first of this series of three volumes was reviewed earlier (MANUFACTURING CHEMIST, September 1960, p. 407). Volume II is concerned entirely with taxonomy.

Prof. Waksman has been closely interested in the Actinomycetes for over 40 years, and no one is better qualified to assess the present position of their taxonomic grouping. He begins by summarising the reasons why Actinomycetes should be classed as bacteria rather than as fungi. In this connection he writes: "Neither Actinomycetes nor bacteria have been shown to contain true nuclei; they both contain only chromatin granules distributed through the hyphae or the cells"—a statement that is comforting to older bacteriologists who are sometimes bewildered at what they regard as a loose modern usage of the term "nucleus."

In the provisional classification set out in this book Waksman recognises 10 good genera in the Actinomycetales (from which he excludes *Mycobacterium*). These are: *Actinomyces* and *Nocardia*; *Streptomyces*, *Thermoactinomyces*, *Waksmania*, and *Thermopolyspora*; *Micromonospora* and *Thermomonospora*; *Actinoplanes* and *Streptosporangium*. Certain other genera, at present considered tentative, are also given consideration.

The greater part of the volume is, of course, concerned with the genus *Streptomyces*, on account of its abundance in nature and the large number of well-described species (over 250 are accepted here). With the growing economic significance of members of this genus, notably as producers of antibiotics and vitamins, accurate taxonomy has become correspondingly important.

The book is well illustrated with 66 figures, mostly photomicrographs, and forms an essential reference book for those engaged in the economic exploitation of Actinomycetes.

L. D. GALLOWAY.

AMERICAN COMMENTARY

(Continued from opposite page)

Trecator, or ethionamide, is used experimentally in human tuberculosis (Ives-Cameron).

Vernamycin is an antibiotic derived from an organism found in Californian soil (Squibb).

Synthetic organic production

U.S. production in 1960 of over 6,000 synthetic organic chemicals and their raw materials was 96,729 million lb., or 7·6% more than in 1959. Sales of these products in 1960 amounted to 55,538 million lb., valued at \$7,507 million, compared with 52,973 million lb., valued at \$7,267 million, in 1959.

The report includes statistics on finished synthetic organic chemicals and chemical products. The total output of such products amounted to 44,350 (41,856) million lb. in 1960 (1959). The groups for which increases in output were greatest were plasticisers (11·7%), pesticides and other organic agricultural chemicals (19·6%), flavour and perfume materials (9·9%), and medicinal chemicals (6·8%).

American Commentary

NEWS AND VIEWS OF THE U.S. PHARMACEUTICAL INDUSTRY

by Dr. Rudolf Seiden

*Coal tar imports ★ Metric for narcotics ★ Insecticides output ★ Anti-coagulant hazard ★ False advertising
Well proven drugs ★ New drugs*

Imports of coal-tar products

The U.S. Tariff Commission's latest report on U.S. imports provides detailed statistics on coal-tar intermediates, coal-tar dyes, medicinals and pharmaceuticals, flavour and perfume materials, and other coal-tar products.

The imports of coal-tar intermediates in 1960 (1959) totalled 19.8 (28.8) million lb., with a foreign invoice value of \$11.5 (14.0) million. About 40% of total imports of these products in 1960 came from West Germany. Imports from the U.K. amounted to 2 million lb.

Imports in 1960 (1959) of all finished coal-tar products comprised 1,770 (1,968) items, with a total weight of 12.3 (11.3) million lb., and an invoice value of \$22.2 (21.9) million. Medicinals and pharmaceuticals were the most important group of imported finished coal-tar products, with 47% of the total value.

Narcotic drugs in metric units

The U.S. Bureau of Narcotics notified manufacturers of narcotic preparations to change the labels so as to show the contents in metric measurements. Also, under the new law, these drugs must now be identified as Class A=narcotics under full control; Class B=narcotics permissible on oral prescription; Class X=preparations under moderate control, and Class M=preparations under minimum control.

Insecticide production

The following table gives, in thousand dollars, the value of the insecticide products used in the U.S. in the last two years (values are at the manufacturers' level):

	1959	1960
Hexachlorocyclohexane	4,136	6,740
DDT	31,348	29,445
Other chlorinated insecticides ..	59,595	59,786
Methyl parathion ..	4,610	9,080
Parathion ..	6,701	5,288
All others ..	10,407	15,111
Totals	116,803	125,450

Dangerous anticoagulant

The F.D.A. has said that phenindione, one of the earlier anticoagulants, is to be used with great care, after recurring reports of injury, including several deaths, have been made. From now on, products containing phenindione must carry a warning, stating that it may cause blood dyscrasias (agranulocytosis) and hepatitis; that periodic blood studies and liver function tests should be performed; and that the use of the drug should be discontinued if leukopenia occurs or evidence of dermatitis or fever appears. However, this warning is not required for the newer derivatives of the drug which are also widely used as anticoagulants.

False advertising claims

The Federal Trade Commission (FTC) declares that the "fastest relief of pain" claims made by various pharmaceutical firms are false advertising. This is true for *Anacin* (American Home Products), *Bufferin* and *Excedrin* (Bristol-Myers), *St. Joseph Aspirin* (Plough), and *Bayers Aspirin* (Sterling). "No significant differences exist between the rate of speed of pain relief," says the FTC.

Advertising of dentifrices which promise "complete protection" are also said to be misleading. Colgate's claim of "forming an invisible shield against varied missiles" was declared to be illegal.

Time-tested drugs

Of the 219 drugs which were included in the first U.S. Pharmacopoeia published in 1820, 54 have been retained in every revision of the work over a period of 141 years.

These are the 54 U.S.P. drugs which have stood the test of time:

Acacia, Alcohol, Aloe, Ammoniated Mercury, Ammonium Carbonate, Ammonium Chloride, Ammonium Hydroxide, Anise Oil, Antimony Potassium Tartrate, Aspidium;

Belladonna Leaf, Benzoic Acid,

Benzoin;

Calcium Carbonate, Castor Oil, Cinnamon Oil, Citric Acid, Clove Oil;

Digitalis;

Ether;

Fennel Oil, Ferrous Sulphate;

Glycyrrhiza;

Hydrochloric Acid;

Ipecac;

Lavender Oil, Lemon Oil;

Magnesium Carbonate, Magnesium Oxide, Magnesium Sulphate, Methyl Salicylate, Myristica Oil;

Olive Oil, Orange Oil, Opium;

Peppermint, Potassium Bicarbonate, Potassium Hydroxide;

Silver Nitrate, Sodium Borate, Sodium Chloride, Spermaceti, Storax, Stronger Rose Water, Sucrose, Sulphur;

Tolu Balsam, Tragacanth;

White Wax, Wild Cherry Bark;

Zinc Oxide, Zinc Sulphate.

New drugs

Isopregnenone, or Duphaston, is β -10a-pregna-4,6-diene-3,20-dione, a progesterone-type hormone (Philips-Roxane).

N3, or 1-methyl-5,5-phenyl-ethylhydantoin, is being tested for use in epileptic seizures (Sandoz).

Periactin, or cyproheptadine HCl, is an agent for the oral treatment of itching (Merck, Sharp and Dome).

Robanul, or Glycopyrrrolate, is 1-methyl-3-pyrrolidyl-a-phenyl-cyclopentaneglycolate methobromide, used orally in anti-cholinergic therapy (Robins).

Torecan, or thiethylperazine maleate, is an anti-emetic and anti-nauseant (Sandoz).

Alphadrol, a new corticosteroid, is being tested for its anti-inflammatory and anti-allergic effects (Upjohn).

Carbocaine, or mepivacaine, is a local anaesthetic (Winthrop).

Cordan, or flurandrenolone, is a topically used steroid (Lilly).

Renese, or polythiazide, is recommended for hypertension and oedema (Pfizer).

(Continued on opposite page)

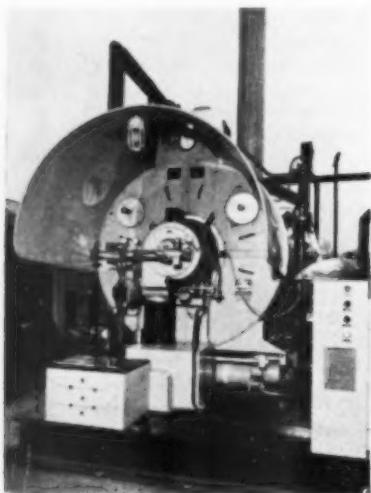
Plant and Equipment

►BOTTLE CLEANERS

H. Strunck and Co. of Köln-Ehrenfeld produce three machines for cleaning glass bottles and plastic containers. The dry cleaning of bottles is becoming progressively more popular and two of the machines are designed for this purpose.

Dry cleaning machine Type TRAB-N works batchwise as follows: the batch of bottles is turned through 180° and blown out. The output of the machine is up to 4,000 bottles

Dawson straight through conveyor or type animal cage cleaning machine is available in a variety of sizes.



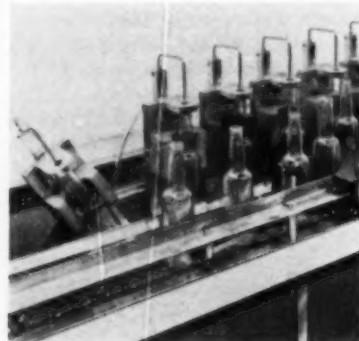
OUT-OF-DOORS BOILER

Although standing out-of-doors since it was bought a year ago, a G.W.B. Powermaster packaged boiler installed at Burts and Harvey Ltd., Southampton chemical manufacturers, has saved the firm £3,500 in steam costs during the first 12 months. The company has been continually expanding operations and this made it difficult to forecast future steam requirements. For this reason they decided to defer the building of a boiler house, and erected the Powermaster in the open.

The boiler rests on a concrete base and is protected from the weather by two steel canopies which cover the Voriflow burner and electrical control panel. Further protection was unnecessary. Despite the fact that it has been exposed to the elements for more than a year the thermal efficiency of the boiler is still 83% and it is reported to be completely trouble-free.

The boiler, a Model 200, is capable of raising 6,900 lb. steam/hr. This steam is utilised for general process heating and distillation. Only a small proportion is used for space heating at the present time. It runs for 24 hours a day, six days a week, and by comparison with its predecessor has lowered steam costs by £3,500/yr.

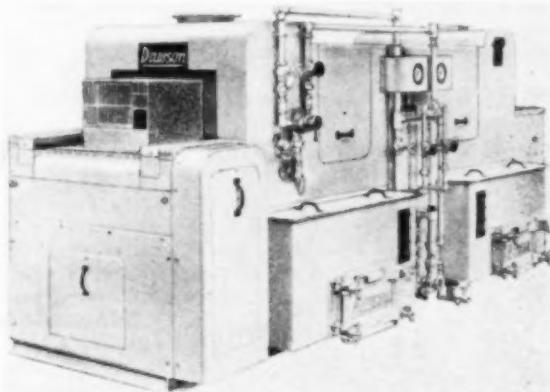
per hr. Type TRAB 201 is an improved version that works continuously. The bottles are carried through on a conveyor, turned through 180°, blown out and carried on by the conveyor. Bottles of



Close-up of automatic machine for the dry cleaning of pharmaceutical bottles, designed and produced by H. Strunck and Co.

unusual shape can be handled by this machine and it is designed for incorporation in a fully automatic packaging line. The output is up to 9,000 bottles per hr.

Type MS II is a machine for cleaning used bottles, including those with labels still adhering. The bottles are cleaned in several phases by the injection of detergent, warm and cold water. Two re-pumping devices, fitted with electrical heating, enable the cleaning liquids to be used repeatedly. The machine is provided with self-acting label removing device and it can deal with between 1,150 and 4,600 bottles per hr.



►ANIMAL CAGE WASHER

Nearing completion at the French National Cancer Research Institute at Villejuif (Seine) is a new animal house in which will be bred for research purposes rabbits, rats, mice and hamsters. These will be kept in a variety of cages ranging in size from 20 in. by 20 in. by 28 in. high to 47 in. by 83 in. by 53 in. high.

All these cages will have to be washed and sterilised regularly and for this purpose the Institute has placed an order for an animal cage washer with Dawson Bros. Ltd. of Gomersal, near Leeds. This machine

(To foot of opposite page)



VALVE HEATER

Valves handling viscous liquids have to be kept at elevated temperatures so that flow is maintained and coagulation avoided. Isopad Ltd. have produced a heating mantle for this purpose which comprises the heating surface, thermal insulation and outer metal casing. Isomantles are made in a range of different loadings for valves between $\frac{1}{2}$ in. and 12 in. bore and a special design is available for use in flameproof areas.

TESTIMANIA

By John Brooks

"I'm obliged to your lordship. Your lordship is exceedingly good. I will put the question more directly to the witness. Did you, Dr. Litmus, perform the Squeeze Test on a sample of Exhibit A?"

"Rees Test, sir? Lee's Test, did you say? As I was saying, in the light of British Standards 1910/14 and my own conclusions with particular respect to its glycerol content and total free alkali, this soap—"

Learned counsel held aloft a gowned arm, then made an elaborate pantomime of studying the notes on his brief. He swept appealing eyes around the courtroom as if searching for truant sanity.

"Come now, Doctor," he urged very softly. "Am I right in saying that I was not talking about British Standards? Precisely so. Then have the goodness to answer the question. The Squeeze Test. Will you now tell m'lord, m'mb'rs of the jury, what were your findings?"

"I performed no test of that name."

The court reporters put on a burst of scribbling, the public whispered. The Court was disquieted and scratched its ear.

"Are you saying," it querulated, "that this scientific experiment was not performed by your department at all?"

"I've never heard of it, m'lord."

For a few seconds they regarded each other with some astonishment. Then:

"Proceed, Sir Jocelyn," the judge said.

"I'm afraid I find myself in difficulties, m'lord. In the absence of this vital evidence it will be hard to establish *prima facie* . . ."

"Precisely what is the Squeeze Test, Sir Jocelyn?"

"I am instructed, m'lord, that the lubricity—perhaps smoothness would be a more fitting word before the Court—of a soap may be ascertained by taking a tablet of it between the palms of both hands and squeezing it in such a way as to project it violently forward, when it will describe a parabola of easily measurable magnitude before falling back into the bath-water."

"Bath-water, was that?"

"If it pleases your lordship. It is a piece of comparative research that has been clearly and frequently demonstrated on television by a well-known musical comedy actress."

"What is television, Sir Jocelyn?"

"Ha! Your lordship is very good indeed."

Much later, his lordship directed the jury that in the absence of testimony they must find for the plaintiff in the now-famous action brought by 18-stone Mrs.

Amelia Gedge against Amalgamated Toiletries alleging their responsibility for multiple contusions sustained by her stepping into a bath containing a tablet of soap manufactured by themselves or their servants.

The verdict was to have far-reaching consequences. It was a warning that scientists who were supposed to be serving the citizen were, in fact, lagging behind him. It was a clear statement that no longer could they fall back on outworn scientific shibboleths to evaluate a product to the public's satisfaction. They were out of court.

That is now history. Today we are accustomed to seeing effervescent chemists in spotless lab-coats innocent of workaday acid burns demonstrating before audiences of millions how, by standing near a sunny window, critical colour comparisons on selected fabrics may be performed. They simply look at them. Science is coming to terms with the effects of the Eleven-Plus on the layman.

New vistas continually open. A recent major breakthrough in the realms of physics shows how the adhesive qualities of a film of paint may be investigated by just anyone at all. Without going into great detail, the process involves buckling a strip of painted tin between the fingers and afterwards peering at it closely. It may well be that proximity to a well-lighted window would also help in this investigation.

The complete home chemist in the rôle of food analyst may, and for all we know does, undertake to taste the difference between a variety of chummy gravy-mixes. Training in data collation and tidy-mindedness may eventually lead to a proof why *Bubo* is three-ways nastier.

But there are portents that the scientist is catching up again. His use of a sensitive light-meter to prove that teeth are 10% whiter may have applications in the romantic field, and one day electronic whigmaleeries may measure glamour so accurately that a man need no longer fear marrying a pig-in-a-poke.

That is why the decision is eagerly awaited in a case shortly to come up, that has already been dubbed the "Test your Magnetic Attraction Case." The defendants in this, a test case, will be the vendors of Ponsonby's Original Iron Filings. A distinguished Fellow is expected to try to make himself understood.

It is to be hoped that his word will carry as much weight as did another expert's, testifying on appeal, when the manufacturers of Mothbane were, by the undissenting verdict of their lordships, found guilty of insecticide.

will operate on the straight-through principle, with the cages being loaded on to a conveyor at one end, carried through the treatment at a regulated speed and discharged at the opposite end of the machine. As the cages pass through the machine they will receive a three-stage treatment delivered from banks of powerful jet pipes above and below the

conveyor. The first stage will be a detergent wash at 160°F. followed by a recirculated hot-water wash at 180°F. and finally a fresh-water rinse at 190°F. The continually ascending temperature will ensure a high degree of commercial sterility.

The two basic types of machine are the conveyor type and the cabinet type. Both are available in

a variety of sizes to suit cages of all sizes and conditions. The cabinet machines are of two types—single and double compartment. The single cabinet can be for washing only or can incorporate a rinsing treatment as well. The double compartment machine usually has one cabinet for the washing treatment and the other for rinsing.

Glaxo reorganises—new Group structure

Keener competition and finer profit margins were forecast by Sir Harry Jephcott, chairman of Glaxo Laboratories, in his annual review with the accounts for the year to June 1961. In that year turnover increased by 7% but trading profits before tax declined by 4%, which, with the increase in profits tax, led to a cut of 8% in profits after tax. Net profit was £3,717,801. Dividend was increased fractionally to 15%.

During the year Glaxo bought Evans Medical Supplies Ltd. and the group now

manager of the Glaxo Group Ltd.

Research and development will be hived off under a new subsidiary—Glaxo Research Ltd.

The change of name does not invalidate the shares issued under the name of Glaxo Laboratories Ltd.

Willingness to co-operate with the Ministry of Health to cut drug prices was evident throughout Sir Harry Jephcott's review. Glaxo's price cuts announced in 1961 will save the Ministry £500,000 in a full year. The purchase by the Ministry

The new directors of Glaxo Laboratories Ltd. Left to right: Dr. F. J. Wilkins, W. J. Hurran and O. F. Morgan.



comprises more than 60 subsidiary and sub-subsidiary companies. To improve management a new group structure will be instituted. Glaxo Laboratories Ltd. will become the Glaxo Group Ltd., and a new subsidiary company will be formed under the old name to carry on all the activities previously carried on by Glaxo Laboratories. Dr. F. J. Wilkins will become chairman and managing director of the new subsidiary and O. F. Morgan and W. J. Hurran joint deputy managing directors. There will be no changes in main board directorships except that H. W. Palmer will be general

of pirated drugs was called a "disaster." "The country's economy will lose more than the Ministry gains." Sir Harry could be reasonably objective about this because only one of the drugs is made by a Glaxo company, and then in a modest way. But he thought that mere criticism was simply unhelpful and put forward the plan for endorsing drug patents "Licences of Right" which is discussed in our Editorial columns.

Drug prices may be cut, but the cost of plant extensions continues to rise. During 1960-61 the Group spent £1.8 million on manufacturing facilities.

Cold vaccine test

Three companies, Burroughs Wellcome, Glaxo and Pfizer, are co-operating in research being carried out by the Medical Research Council on vaccines against the common cold. Small-scale human trials will soon begin with killed virus vaccines. Work is also being done on live vaccines.

First polyisobutylene plant

W. R. Grace and Co. will build the first polyisobutylene plant in the United Kingdom at Baglan Bay, South Wales. Scheduled for completion by the end of 1962, the plant will be designed and constructed by Parsons Power Gas of London and will have an annual rated capacity of 8 million lb.

A full range of polyisobutylene will be produced offering molecular weights from 600 to 2,000. It is an important

ingredient in the manufacture of numerous end-products including lubricating oil additives, caulking and sealing compounds. It is also used in the electrical, adhesive and metal industries.

Disposable injectors

Mr. H. E. Bell, managing director of Ampins Ltd., points out that disposable injectors marketed under the name *Ampins* are used not only for antibiotics but also for many other drugs. The note on p. 436 of our September issue referred to *Distampins*, the trade name for *Ampins* used by the Distillers Co. and which contain penicillin and streptomycin. *Ampins* containing other drugs are made by Cuxson Gerrard and Co.

Laporte H₂O₂ process for Germany

The Elektrochemische Werke München, A.G., which earlier this year

became a member of the Laporte Industries Group, is to construct a large plant for the production of hydrogen peroxide by the Laporte autoxidation process, operated in the U.K. by Laporte Chemicals Ltd. at Warrington.

The new plant will be at the E.W.M. works at Hollriegelskreuth, near Munich.

Italian bentonites

Chemicals and Feeds Ltd., London, E.C.4, have been appointed sole agents for the United Kingdom and various other countries, for the Italian 7C range of bentonites produced by Ditta Dott. Settimio Cinicola of Milan.

These bentonites are claimed to have certain characteristics similar to the Wyoming bentonites, although they are much cheaper.

Different grades are produced to suit the special requirements of many industries.

Chemicals and Feeds Ltd. have also become sole United Kingdom and European agents for ground manganese carbonate (rhodochrosite ore), from the Taylor-Knapp Co. of Montana.

Cheaper antibiotics

Glaxo Laboratories Ltd. have reduced the prices of many of their pharmaceuticals, including antibiotics and corticosteroids. Price rebates are available to the retail trade.

Representative reductions are, NaClex Tablets, 50 mg., 25 reduced from 9s. to 7s. 4d. (retail); Crystamycin 10 x single-dose vials, from 26s. 3d. to 21s. 9d.; Prednelan Tablets, 5 mg., 30 reduced from 10s. 6d. to 9s. 2d.

I.C.I. have reduced the price of their injectable penicillins by about 10%. This follows recent cuts in prices of certain of their other antibacterials.

The Distillers Co. (Biochemicals) Ltd. have also cut their prices. Injections of benzyl penicillin and streptomycin became cheaper on November 13.

Grant for virus research

A grant of \$940,000, payable in yearly amounts of \$188,000 for a period of five years, has been awarded to the World Health Organisation by the National Institutes of Health of the U.S. Public Health Service to further research on virus diseases.

New Pfizer division

A new division, called Agricare Products, has been formed by Pfizer to market a wide range of sheep biologicals through agricultural chemists. Agricare Products will provide the farmer with vaccines and sera to prevent many sheep diseases.

Murphy take over Schering's farm products

British Schering Ltd., have wound-up their agricultural sales department, and the Murphy Chemical Co. Ltd., of Wheathampstead, are now handling all the agricultural products hitherto supplied by Schering. These products include *Misto-O-Matic* liquid seed dressings.

Schimmel of New York acquires Schimmel Boehm

Schimmel Boehm Ltd., formerly jointly owned by Schimmel and Co. Inc. of New York, and Fredk. Boehm Ltd. of 19 Bentinck Street, London, W.I., was taken over on November 1 by Schimmel and Co. Inc.

Mr. J. A. Clark has been appointed managing director, and Mr. J. A. Stilwell (U.S.A.) and Mr. Gert Keller (U.S.A.), remain with the company as co-directors.

All purchasing for Schimmel Boehm Ltd., hitherto made by Fredk. Boehm Ltd., will now be undertaken by Schimmel Boehm Ltd.

New offices, laboratories and factory premises are being arranged.

Changes of address

Sipon Products Ltd. have moved to 20 Newman Street, London, W.I (Telephone Museum 9104/5).

Electroweighers (Birmingham) Ltd. have moved to Bickford Road, Witton, Birmingham 6 (Telephone EAS 3216).

Agent for German mixers

K. W. Chemicals Ltd., of Caroline House, 55/57 High Holborn, London, W.C.1, have been appointed as U.K. selling concessionaires for Draiswerke G.m.b.H., of Mannheim/Waldhof, for the sale of their machinery, including specialised mixing and grinding equipment for the pharmaceutical and general chemical industries.

New telephone numbers

Merck Sharp and Dohme Ltd., Hoddesdon, Herts, have changed their telephone number to Hoddesdon 4511 and 4521.

The telephone number of the A.P.V. Co. Ltd. and A.P.V.-Paramount Ltd. has been changed to Crawley 27777.

Chemist honoured

The Royal Society has awarded the Davy Medal to Prof. D. H. R. Barton, F.R.S., professor of organic chemistry at the Imperial College, University of London, for his distinguished researches in organic chemistry, particularly on the structure and stereochemistry of natural products of the terpene and steroid series; and the analysis of the conformation of cyclic structures.

People

The board of Benger Laboratories Ltd. has been changed. **A. Wormald** becomes chairman, **P. S. Needham** managing director, and **Dr. R. Powell** general manager. **B. D. Thornley**, who was managing director, has resigned from the board. Mr. Wormald is a managing director of Fisons Ltd., and Mr. Needham is managing director of Genatosan Ltd.

Geigy (Holdings) Ltd. of Manchester have elected the following directors as from January 1:

Dr. F. Buchmeier, deputy chairman and managing director, Ashburton Chemical Works Ltd.; deputy chairman, James Anderson and Co. (Colours) Ltd.

H. Jones, deputy chairman and joint managing director, The Geigy Co. Ltd.; director, Ashburton Chemical Works Ltd.

Dr. H. B. Knuchel, chief executive and secretary, Geigy (Holdings) Ltd.; director, The Geigy Co. Ltd.; director, Geigy Pharmaceutical Co. Ltd.

J. A. Rodgers, deputy chairman and managing director, Geigy Pharmaceutical Co. Ltd.

The Gas Council has appointed **Dr. J. A. Gray** head of the new basic research group which the Council is establishing at its London Research Station at Fulham. Dr. Gray has been group leader of physical chemistry and chemical engineering at the Battelle Memorial Institute, Geneva, since 1958. He is 42 and will take up his appointment on February 1. In forming its new basic research group the Gas Council's intention is to provide the industry with the means of developing entirely new ideas for the production and utilisation of gas.

John G. Window, sales director of QVF Ltd., has been elected a director of QVF Glastechnik GmbH, of Schierstein, Germany.

The Fertiliser Manufacturers' Association have elected **J. S. Watkins** president and **Thomas Williams** vice-president for 1961-62. Mr. Watkins is fertiliser products sales manager at the Billingham Division of I.C.I. Mr. Williams is chairman and managing director of the Eaglescliffe Chemical Co. Ltd.

H. and T. Proctor Ltd., fertiliser manufacturers of Cathay, Bristol, who will celebrate their 150th anniversary in 1962, have appointed **D. P. Hopkins**, B.Sc., F.R.I.C., as chairman, **C. A. Bailey** as managing director, and **P. K. Proctor**, J.P., as vice-chairman. The company, believed to be the oldest

fertiliser firm in the world, has occupied its main works since 1812, but through acquiring the business and works of J. H. and A. Cole Ltd., Feeder Rd., Bristol, a few years ago, it now has a second works where organic fertilisers and feeding stuffs are produced.

Mr. Hopkins has been a regular contributor to MANUFACTURING CHEMIST for over 15 years.

T. E. Peacock and **A. C. Nicholson**, joint managing directors of Laporte Acids Ltd., have been appointed directors of James Wilkinson and Son Ltd., specialising in aqueous hydrofluoric acid and inorganic fluorine compounds.

Mr. Nicholson has also been appointed a director of the Sheffield Chemical Co. Ltd.

J. Hill has been appointed secretary of Laporte Acids, James Wilkinson, and the Sheffield Chemical Co. He is also accountancy manager of these companies.

Dr. E. M. Glaser has been appointed director of research at Evans Medical Ltd., Speke, Liverpool. Since the war he has worked at the Department of Experimental Medicine in Cambridge, was Professor of Physiology at the University of Malaya in Singapore, and a reader at the University of London.

Dr. A. W. Baldwin, lately an associate research manager of I.C.I. Dye-stuffs Division, has been co-opted as a governor of the J. A. Radley Research Institute.

Dr. D. Jack has been appointed director of research at Allen and Hanburys.

R. Blyth, M.P.S., has been appointed editor of *The Pharmaceutical Journal*. He has been responsible for the paper since June. He joined as assistant editor in 1957.

F. L. Waring, managing director of the "Coalite" group of companies, has been elected deputy chairman of the group. He is also vice-chairman of the Chemical and Allied Industries Joint Industrial Council.

Unilever purchase

The boards of Unilever Ltd. and London and Midland Industrials Ltd. have announced that Unilever recently completed the purchase of the whole of the issued share capital of Fixol and Stickphast Ltd. from London and Midland Industrials Ltd.

Sorbitol plant in production

Howards of Ilford, announce that their new sorbitol plant is now in production.

This unit has an annual capacity of 4,000 tons of 70% syrup. This is well above the present market for Sorbitol in the U.K. and is expected to meet any increase in demand for the syrup or the powder over the next few years.

The syrup, which will be sold as *Howsbol I*, finds many applications in the food, confectionery, pharmaceutical and toiletries industries as humectant.

Cambridge instrument assembly wing

The Cambridge Instrument Co.'s new instrument assembly wing was officially opened by Sir Keith Joseph, Minister of State, Board of Trade, recently. The extension represents an additional 15,000 sq. ft. of production space. A large part of this is devoted to the Microscan X-ray analyser, used for investigating the microstructure of metals and minerals, whose rate of production is expected to double within the next few months.

Anglo-Italian instrument merger

Cambridge Instrument Co., Ltd., and Istrumenti di Misura, C.G.S., S.p.A., Milan, Italy, have formed a new joint company, Cambridge-C.G.S.-S.p.A.

The issued capital of the new company, in which each organisation has an equal interest, will be 300 million lire. The factory will be located at Casoria, near Naples, adjoining an existing production plant of Istrumenti di Misura, C.G.S.

Cambridge-C.G.S. will manufacture instruments based on Cambridge designs, including electronic and galvanometric indicators, recorders and control equipment.

Marchon's new ship

Mrs. Otto Secher, wife of the vice-chairman of Marchon Products Ltd. of Whitehaven, launched the motor vessel "Marchon Enterprise" November 9, at Wallsend. The new ship, with a dead weight of about 2,400 tons, will carry phosphate rock.

Lanolin alcohols

Dr. Martin, of Martin-Valer Associates, cosmetic consultants, New York, was the speaker at a meeting organised by Croda Ltd. on October 30 at the Café Royal, London. He was introduced by Croda's chairman, Mr. F. A. S. Wood.

Dr. Martin spoke of current trends in cosmetic formulation in the U.S., with particular reference to the work being carried out with Croda's *Polychol* surface-active agents.

The *Polychols*, ethoxylated lanolin alcohols, are a new range of non-ionic surface-active agents which have been clinically tested and found to be neither a primary irritant nor a sensitiser. Five grades are available, differing from one

another in the number of ethylene oxide groups condensed with the wool wax alcohols, i.e. with 5, 10, 20 and 40 molecules of ethylene oxide. They can be used for aqueous alcoholic systems, clear emulsions and gels.

Medicinal aerosols

A colour film, "Aerosols in Medicine," has been made by Riker Laboratories Ltd. It defines aerosols and explains how they differ from other pressure packs. It outlines the manufacture of medicinal aerosols and emphasises the need for quality control.

Most medicinal aerosols have been designed for external application and include local anaesthetics, corticosteroids, plastic dressings, antibiotics, antiseptics and skin protectives. Before aerosols could be employed in medicine for internal use it was necessary to find some way of controlling dosage. This led to the development of a measuring valve and the Riker "Medihaler" was the first aerosol device delivering a measured dose to be made available for inhalation therapy.

Meldola Medal

The Meldola Medal is the gift of the Society of Maccabees and is normally awarded annually. The next award will be made early in 1962 to the chemist who, being a British subject and under 30 years of age at December 31, 1961, shows the most promise as indicated by his or her published chemical work brought to the notice of the Council of the Royal Institute of Chemistry before December 31, 1961.

No restrictions are placed upon the kind of chemical work or the place in which it is conducted. The merits of the work may be brought to the notice of the Council, either by persons who desire to recommend the candidate or by the candidate himself, by letter addressed to The President, The Royal Institute of Chemistry, 30 Russell Square, London, W.C.1.

The letter should be accompanied by six copies of a short statement on the candidate's career and of a list of titles, with references, of papers or other works published by the candidate, independently or jointly.

THE TECHNICAL PRESS IN DECEMBER

European Refinery Review

Petroleum's special feature this month covers B.P. refineries in Germany and Belgium, Tidewater's new Kalundborg refinery, a survey of Italian refinery and petrochemical manufacture and an article on the economics of European refinery operations. Other articles are: "New Canadian Refinery Operates on Natural Gas Condensate Feedstock" and "Methods of Hydrocarbon Synthesis."

Chemical and Process Engineering contains three articles on corrosion: "Principles of Corrosion applied to Chemical Plant," "Corrosion-resistant Epoxide Linings" and "Amine Treatment of Cooling Water." The series on constructional materials for chemical plant continues with Zinc Coatings and the second part of the article on "Development and Planning Chemical Processes" appears this month.

In **Paint Manufacture** there is a guide to new synthetic resins and articles on "Trimethylolpropane in Alkyds," "Acrylic Copolymer Emulsions," and "A New Silicone Paint System for Heat and Corrosion Resistance."

Food Manufacture's special feature this month is evaporation and concentration. There is a description of the Wassa Swedish Crispbread Factory and an article on "Keeping Quality of Frozen Foods."

Articles in the current issue of **Automation Progress** include: "Digital Computers, Trends in Use and Design," "Digital Computer Production," and a review of Modern Computing Methods.

Dairy Engineering contains a review of the Royal Dairy Show and articles on "Modern Trends in Yoghurt Manufacture," "Planning Rindless Cheese Production," and "Technical Developments in Bavaria."

Muck Shifter and Bulk Handler describes brakes, clutches and transmissions. There are also articles on "Time Studies on Crawler-Mounted Leaders and Motor-Scrapers" and "Foundations for Factory with Heavy Machines."

Fibres and Plastics includes a feature on Asbestos Processing and articles on "Enhancing the Usefulness of Fibres and Fabrics," "Man-made Yarns and Fibres in Holland" and "Asbestos Fibres in Building." There is a review of fibres and plastics in the building industry.

In **Corrosion Technology** there are articles on "Submarine Corrosion Detection by Closed-circuit TV," "Corrosion of Turbines in the Electrical Power Industry," "Corrosion Problems in Chile" and "Anti-corrosion Treatment for the Tamar Bridge."

Building Materials contains a description of some notable developments in concrete roofs—flat and curved. There is a review of "New Buildings, Projected, In course of Construction and Recently Completed."

World Crops describes "Spray Drift—Effects of MCPA on Vegetables." Other articles are: "Plant Protection Seed Dressing Policy" and "Vegetable Growing in Malaya."

For specimen copies apply to the Circulation Manager, Leonard Hill House, Eden Street, London, N.W.1.

Evans' take-over

Evans Medical Ltd. have acquired the business of Loftouse and Saltmer, manufacturing chemists, of Hull.

European association of pesticide makers

British manufacturers of pesticides seem to have anticipated the probability of Britain's entry into the Common Market. Through their trade associations, A.B.M.A.C. and I.P.C.A., they have had their feet under the European table since the beginning of 1959 when they became founder members of the "Groupement Européen des Associations Nationales de Fabricants de Pesticides."

The origin and objects of GEFAP were described by Mr. D. J. S. Hartt in a talk given in London to members of the Industrial Pest Control Association. Mr. Hartt, who is the immediate past-president of the Association, and its representative on GEFAP, was able to describe from personal experience how the British and Continental Associations have been working together to promote the safe and rational use of pesticides.

More agricultural chemicals approved

The following products additional to the 1961 list of approved products have been approved under the Agricultural Chemicals Approval Scheme:

Insecticides

Gamma-BHC (Lindane)—Emulsions and miscible liquids

P.B.I. Lindane 20—Pan Britannica Industries Ltd.

DDT—Wettable powders.

Bugge's DDT 50% Wettable Powder
—Bugge's Insecticides Ltd.

Malathion—Sprays.

Malathox 60—Pan Britannica Industries Ltd.

Parathion—Sprays.

Fosfox—Pan Britannica Industries Ltd.

Fungicides

Organo-mercury—Foliage sprays.

Baywood Liquid Mercury—Baywood Chemicals Ltd.

Zineb—Dusts.

Zebenide Dust—Plant Protection Ltd.

Zineb—Wettable powders.

Dithane Wettable—Pan Britannica Industries Ltd.

P.P. Zineb Fungicide Plant

Zebenide (available in Channel Islands only) Protection Ltd.

Zelnone—Baywood Chemicals Ltd.

Herbicides

2,4,5-T—Ester sprays.

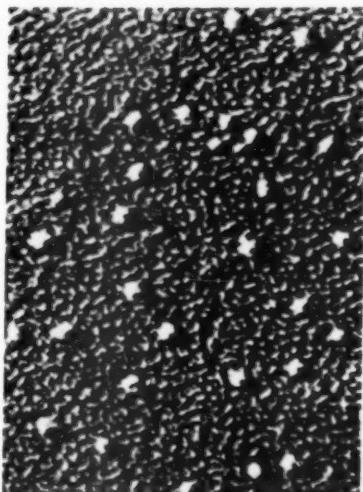
Marks Brushwood Killer—A. H. Marks and Co. Ltd.

Seed Dressings

Aldrin—Liquid seed dressings.

Metham-sodium—Liquid formulations.

Vitafume—Vitax Ltd.



VIRUS $\times 53,000$

Parke, Davis and Co. recently released this photograph, the first to appear in Britain of the virus of infectious hepatitis, a liver infection which is often the cause of jaundice. The pea-shaped virus particles, photographed through an electron microscope at a magnification of 53,000, are 12-18 μ in diameter (a μ is equal to 1/25,000,000 of an inch). In comparison, the polio virus, the first electron-micrographs of which were also prepared by Parke-Davis scientists (in 1953), is about 30 μ in diameter. Isolation of the hepatitis virus was achieved about five years ago, but only recently has it been possible to concentrate and purify the virus to a point where it could be photographed.

Ampoules specification

The revised British Standard specification for ampoules (B.S. 795 : 1961) includes six new types of ampoules. They are:

Type N. Flat bottom, open-funnel, narrow stem ampoules, with constriction.

Type P. Flat bottom, narrow stem, cut ampoules (for tip sealing), with constriction.

Type Q. Flat bottom, narrow stem, cut ampoules (for draw-off sealing), with constriction.

Type M. Flat bottom, wide stem ampoules, with constriction.

Type S. Flat bottom, open-funnel, wide stem ampoules, with constriction.

Type R. Flat bottom, wide stem, cut ampoules, with constriction.

It has been found expedient to eliminate the moulded flat and round bottom straight stem ampoules, with and without cutting ring. Requirements for the shape of the shoulder of ampoules have also been deleted, but in order to control the shape a new dimension for the height to the centre of the constriction has been added.

Requirements for the five other types

of ampoules covered in the 1953 edition of the standard have been brought up to date, especially with regard to capacities and dimensions. As the result of technical improvements, tighter tolerances have been specified on certain dimensions. In some cases the diameter of the ampoule has been increased to give a wider, squatter, more stable ampoule, while in other cases it has been decreased to bring it into line with current practice. Alternative wide stems have been specified in three instances to facilitate the filling of the ampoule with powder.

The test given in the appendix for the limit of alkalinity for neutral glass ampoules has been re-drafted.

Copies of this standard may be obtained from the British Standards Institution, 2 Park Street, London, W.1, price 8s. 6d. each.

Approved names for drugs

The October supplementary list of approved names issued by the British Pharmacopoeia Commission is as follows. Enquiries should be sent to the Commission at 44 Hallam Street, London, W.1.

Approved Name	Other Names
AMPICILLIN	6-[(-)- α -Aminophenylacetamido]penicillanic acid [(-)- α -Aminobenzyl]penicillin Penbritin
BENZPHETAMINE	N-Benzyl-N ₂ -dimethylphenethylamine Didrex is the hydrochloride
BUTYLATED HYDROXYANISOLE	A mixture of 2-tert.butyl-4-methoxyphenol and 3-tert.butyl-4-methoxyphenol
BUTYLATED HYDROXYTOLUENE	2-6-Di-tert.butyl-p-cresol
DROXYPROPINE	1-[2-(2-Hydroxyethoxyethyl)]-4-phenyl-4- propionylpiperidine
NICOCODINE	6-Nicotinoylcodine
OXETHAZINE	2-Di-(N-methyl-N-phenyl-tert.butylcarba- moylmethyl)-aminoethanol
TRIFRAME	4-(4-Carbamoyl-4-piperidinopiperidino-2-2- diphenylbutyronitrile
PLASMIN	The proteolytic enzyme derived from the activation of plasminogen Actase is Plasmin (human)
PROPICLILIN	6-(α -Phenoxybutyramido)penicillanic acid (1-Phenoxypropyl)penicillin Brocillin is the potassium salt; Ultrapen is the potassium salt
RIFAMYCIN	Antibiotics isolated from a strain of <i>Streptomyces</i> <i>mediterranei</i> (specific substances are designated by a terminal letter; thus, Rifomycin B)
SYROSINGOPINE	Methyl 18-(4-ethoxycarbonyloxy-3:5-dimethoxy- benzoyl)-reserpate Singersep
TOLPROPAMINE	NN-Dimethyl-3-phenyl-3-p-tolylpropylamine
TRONOXIM TOSYLATE	Triethyl-2-(3:4:5-trimethoxybenzoyloxy)- ethylammonium tosylate (Tosylic acid is the trivial name for p-toluenesulphonic acid)
TRONYPPROLIUM TOSYLATE	Triethyl-2-(3:4:5-trimethoxybenzoyloxy)- ethylpyrrolidinium tosylate (Tosylic acid is the trivial name for p-toluenesulphonic acid)
VINBLASTINE	An alkaloid extracted from <i>Vincetoxicum</i> Velbe is the sulphate
INDEX TO THE SUPPLEMENTARY LIST	
Proprietary Name	Approved Name
Actase	Plasmin
Brocillin	Propicillin
Didrex	Benzphetamine
Penbritin	Ampicillin
Singersep	Syrosingopine
Ultrapen	Propicillin
Velbe	Vinblastine

News from Abroad

AUSTRALIA

German pharmaceutical expansion

Farbenfabriken Bayer AG., Leverkusen, West Germany, have formed an Australian subsidiary, FBA Pharmaceuticals (Aust.) Pty. Ltd., with headquarters in Sydney. This new Australian company will bring to the medical and pharmaceutical profession new products developed and manufactured by Farbenfabriken Bayer in Germany.

Among the many pharmaceutical products originated by the German company are acetylsalicylic acid, phenacetin, phenobarbitone, synthetic anti-malarials, tuberculostatics, sulphonamides, etc.

Directors of the new Australian company will be H. W. Luyken, E. J. Willis, A. Roehder, and Dr. F. Harenberg.

New antibiotic developments

Authorities of the National University of Canberra have confirmed reports that an Australian research team has achieved a major breakthrough in the fight against many diseases that are highly resistant to modern drugs, and include *Staphylococcus aureus* (golden staph), an infection that attacks surgical patients and newborn babies.

Prof. Ennor, dean of the John Curtin School of Medical Research, said that spectacular results had been achieved in tests of the new range of antibiotic drugs developed at the National University. They had been able to cure many infections resistant to penicillin and other antibiotics. The new antibiotic could also be used to treat people who had become allergic to the older drugs.

Prof. Ennor said that in their present form the new drugs were poisonous if swallowed, but seemed to have no poisonous effects if applied to the skin. The drugs were developed by a research team led by Prof. F. P. Dwyer, head of the biological inorganic section of the John Curtin School.

PORUGAL

Antibiotics plant

It was reported from Portugal recently that a factory is to be erected at Matinhos, near Oporto, for the manufacture of antibiotics. The enterprise—Sociedade Industrial de Bioquímica "Micofábril," is receiving an investment from a Dutch company.

Production will meet local demand and is scheduled to start next June.

SPAIN

Fertiliser plant extension

Industrias Químicas de Tarragona, of Spain, has applied for authorisation

to add to its fertiliser plant at Tarragona a unit for the production of synthetic ammonia, at an estimated cost of 90 million pesetas. Imported equipment will cost 36½ million pesetas. The annual production of an estimated 9,000 tons will be used wholly by the company for the manufacture of fertilisers.

Fungicides factory

A jointly-owned Spanish company to manufacture and sell dithiocarbamate fungicides will be formed by Energia e Industrias Aragonesas S.A., of Madrid, and E. I. Du Pont de Nemours and Co. of Wilmington, Delaware, U.S.A., subject to approval by the Spanish Government.

The stock of the new joint company, Desarrollo Químico Industrial S.A., will be owned equally by Energia e Industrias Aragonesas and Du Pont.

Desarrollo Químico Industrial S.A. will build a plant at Sabinanigo, at the foot of the Pyrenees, adjacent to an existing plant operated by Energia e Industrias Aragonesas. The new plant is expected to start operation in 1962. Energia e Industrias Aragonesas S.A. will design and build the facility and provide employees to operate it. Du Pont will provide manufacturing technology and basic engineering data.

Initially the new company will produce *Manzate* maneb fungicide and *Parzato* zineb fungicide, both developed by Du Pont research. These two dithiocarbamate fungicides are used to control mildew, leaf blights and fruit rots on fruit and vegetable crops which constitute a substantial portion of Spanish agriculture.

INDIA

Fertiliser speed-up

The Nangal Fertiliser Factory, in India, has stepped up its output to two-thirds of its rated capacity of 1,176 tons of calcium ammonium nitrate a day. Current production is limited to 700-800 tons of fertiliser a day, as the full power load requirement will not be available from Bhakra until April/May 1962.

The Heavy Water Plant, associated unit of the factory, is scheduled for commissioning by the end of this year, and has been designed to produce 14½ tons of heavy water a year.

ARGENTINA

Phenol investment

Hooker Chemical Corporation have announced that the president of Argentina, Arturo Frondizi, has signed a decree approving the company's investment in Duranor, Industrias Químicas Sociedad Anónima Industrial y Comercial, an Argentine affiliate formed to produce phenol using the Hooker process.

Duranor will be located at Rio Tercero, Province of Córdoba, some 450 miles north-west of Buenos Aires.

U.S.A.

Anti-cancer discoveries

A vaccine which is claimed to be effective against some cancers in animals has been developed by Rand Development Corp., Cleveland, Ohio. A virus-like material has been extracted from spontaneous human cancers that were first homogenised with trifluorotrichloroethane, then centrifuged; the virus-like material is in the top layer of three layers produced, and, when grown on tissue culture and injected into animals, causes cancer. Rand also claim to have produced cancers in animals with material from chemically induced cancers.

Dr. H. Francis Havas of the Institute for Cancer Research, Philadelphia, believes that bacteria which normally cause infections in people may also cause spontaneous regression of some cancers. Transplantable mouse tumours were incubated with three strains of haemolytic streptococci, prior to injecting the tumour cells into mice. The percentage of takes of incubated cells ranged from 0-32%, compared with 100% for the control group. Time lapse photographs made at the Institute also prove the destructive effects of the streptococci against tumour cells.

Drug firms cleared

All charges of price fixing and monopoly against five pharmaceutical manufacturers by the U.S. Federal Trade Commission have been dismissed by the Examiner appointed by the Commission to judge the charges. The companies are Bristol, Cyanamid, Pfizer, Squibb and Upjohn.

The Examiner cleared the companies of all charges of conspiracy, price fixing, monopoly and, in addition, upheld the validity of Pfizer's tetracycline patent.

The Examiner's dismissal of all the charges can be appealed for review by the Full Commission.

A Pfizer official in New York said that the U.S. Government's still pending anti-trust suit against three of the companies—Bristol, Cyanamid and Pfizer—appears to be based on the same grounds as the Commission's case and that his company was confident of complete exoneration in that case as well.

NEW ZEALAND

Roussel subsidiary formed

Roussel Laboratories Ltd. have formed a separate company in New Zealand. Roussel (New Zealand) Ltd. has been incorporated in Auckland as a wholly owned subsidiary of Roussel Laboratories Ltd.

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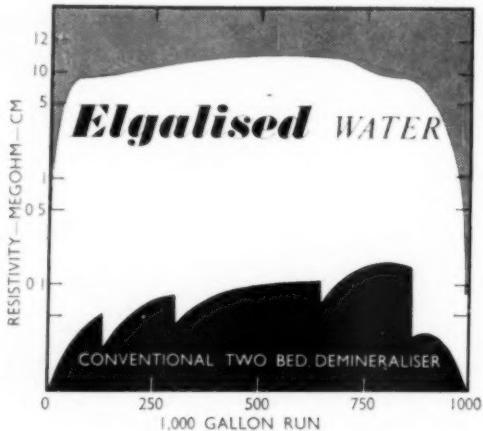
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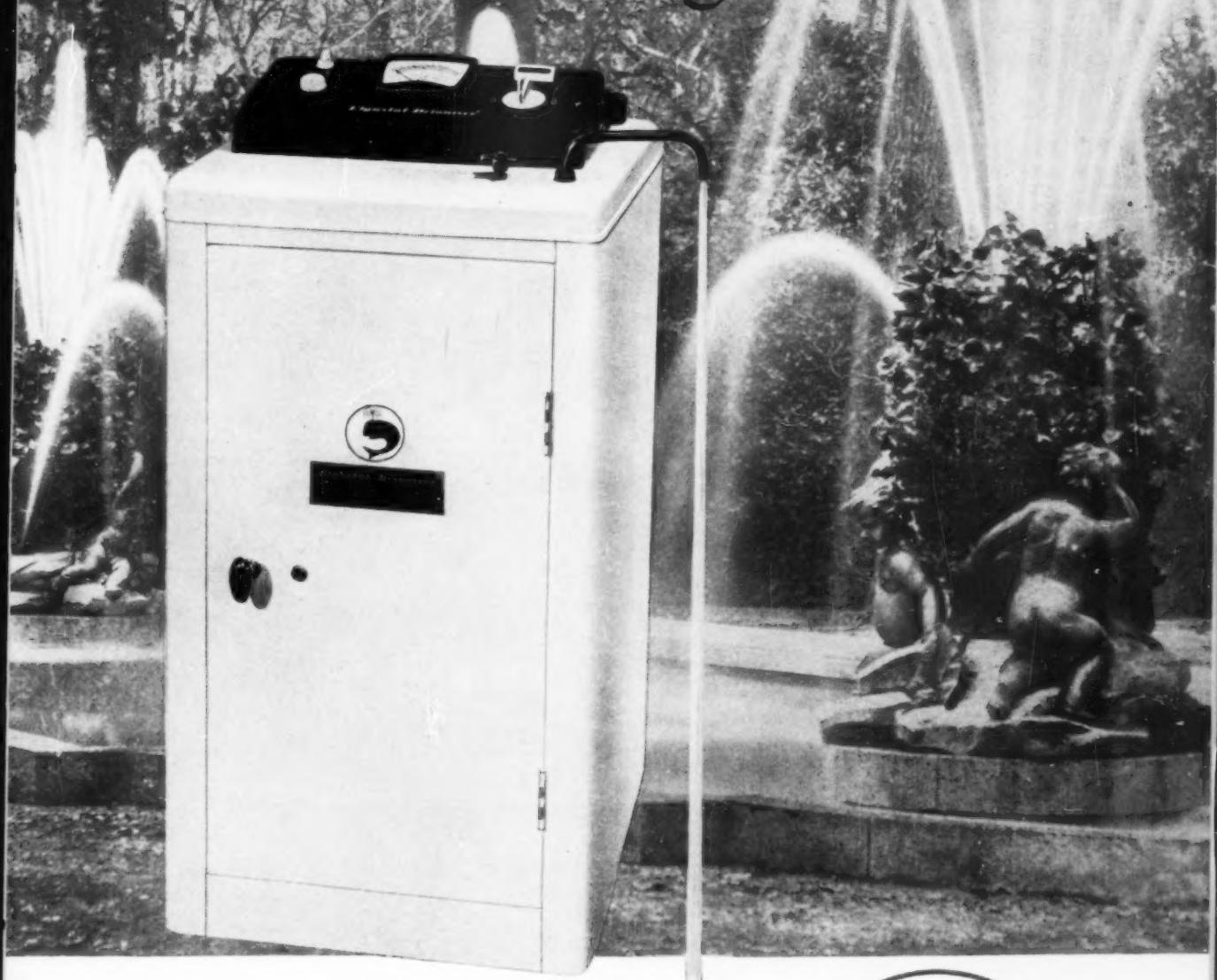
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Tick here if you would like a demonstration.

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MEETINGS

Royal Society of Arts

January 10. "Modern British Drugs," by Frank Hartley. 2.30 p.m. Royal Society of Arts, John Adam Street, London, W.C.2.

The Institute of Sewage Purification

December 20. Symposium. "Chemical Industry Solids Disposal Problems," by M. E. Chodak, including "Disposal of Solids and use of Sludges for Concentrating Radioactive Wastes," by R. H. Burns. Main Hall, Friends House, Euston Road, London, N.W.1.

Pharmaceutical Society

January 10. "The Organisation and Economics of Research in the Pharmaceutical Industry," by Dr. J. Yule Bogue. 17 Bloomsbury Square, London, W.C.1.

Royal Institute of Chemistry

December 7. "Ultra-violet Spectroscopy," by T. M. Dunn. 6.30-7 p.m. Northampton College of Advanced Technology, St. John Street, London, E.C.1.

Society for Analytical Chemistry

December 13. "Fluorescent Indicators for Metals," by W. I. Stephen. 7 p.m. The University, Birmingham 15.

December 15. "The Application of Infra-red Spectroscopy to Problems of Analytical Chemistry," 11.15 a.m. King's College, Strand, London, W.C. 2.

January 10. "Developments in Gas Chromatography, as Applied to Polymers," by D. H. Desty, C. A. Finch and R. S. Lehrle. 2.30 p.m. The University, Birmingham 15.

Society of Instrument Technology

December 12. "Design, Application and Selection of Automatic Control Valves," by P. Stone. 7 p.m. Stanley Palace, Watergate Street, Chester.

January 5. "Measurement of Flow," by J. Singer. 5.45 p.m. Room 4A, Administration Building, Esso Petroleum Co. Ltd., Fawley.

Society of Chemical Industry

December 12. "Production of Low Sulphur Aromatics," by G. Claxton. 14 Belgrave Square, London, S.W.1.

December 18. "The Mothproofing of Wool: Chemical Considerations in Moth-proofing, the Biological Basis of Moth-proofing Tests," by R. S. Hartley and E. A. Parkin. 5.30 p.m. 14 Belgrave Square, London, S.W.1.

January 5. "Recent Advances in the Chemistry of Penicillin," by F. P. Doyle. 6.30 p.m. 14 Belgrave Square, London, S.W.1.

Chemical Society

December 14. "Stereospecific Polymerisation," by C. E. H. Bawn. 7.30 p.m. Lecture Theatre, The Royal Institution, Albemarle Street, W.1.

New Products

Medical food

A new food for sick people, *Infonutrol*, is available in Britain for hospital trials. It is an emulsion of cotton seed oil in water with a small amount of dextrose which is fed intravenously and may replace sugar solutions now used to supply nourishment to patients who cannot take food. *Infonutrol* is said to have an energy value of 1,600 calories per litre. It is made by Astra Laboratories, Sweden, and distributed here by Astra-Hewlett.

Two corticosteroids

I.C.I. Pharmaceuticals Division have added to their range two new corticosteroid products, *Metilar* and *Synalar*.

Metilar paramethasone acetate possesses high anti-inflammatory activity coupled with a minimal exhibition of the undesirable physiological properties of the steroids. Treatment with *Metilar* is said to involve little risk of oedema and abnormalities of electrolyte metabolism are unlikely. *Metilar* may be used whenever systemic therapy with adrenocortical steroids is indicated. It is issued in tablets of 1 mg. and 2 mg. (scored), at 128s. dozen (trade price) for bottles of 25 1 mg. tablets and 240s. dozen for 2 mg. tablets in bottles of 25. Other quantities available are bottles of 100 and 500.

Synalar (topical), fluocinolone acetonide, is claimed to act rapidly at very low concentrations. It can be effective in certain chronic cases resistant to other topically applied steroids and in some lesions resistant to systemic steroid therapy. It may be used safely over long periods.

Synalar is available as a cream, containing 0.025% w/w fluocinolone acetonide in a water miscible cream base; 5 g. tubes 48s. doz. (trade), 15 g. tubes 120s. doz. It is also available as an ointment, containing 0.025% w/w of active agent in a bland paraffin and hydrogenated lanoline base at the same price as the cream, and as a lotion, containing 0.025% w/v of active agent in aqueous suspension, issued in 20 ml. polythene dropper bottles, price 150s. doz. (trade).

Rust, scale, milkstone remover

Diversey *Dilac* is a new product for the removal of scale, rust and milkstone.

Scale has proved to be a serious problem in hospitals, where instruments, autoclaves, sterilisers, syringes, bedpans, urine bottles, are liable to become coated with deposit.

The makers claim that Diversey *Dilac*, used regularly, will remove these deposits quickly and easily. It is claimed to have excellent penetrative and wetting properties, enabling it to loosen and detach deposits very rapidly.

Anti-bumping granules

B.D.H. anti-bumping granules, of fused aluminium oxide, are used in the same way as porous pot to prevent violent boiling in distilling and evaporating procedures.

They are chemically inert, and may be employed for all distillations and evaporation. Their ability to resume their tranquillising function after distillation has been interrupted is particularly valuable in vacuum distillations.

The granules are supplied in 250 g. bottles at 5s. 6d. each. So little is needed for each experiment that their cost is trivial.

Rauwolfia hypotensive

Harmonyl is a new product for the treatment of hypertension from Abbott Laboratories Ltd. It is derived from *Rauwolfia canescens* and clinical trials are said to have shown that, compared with other rauwolfa, *Harmonyl* produces fewer and milder side effects. Dosage is one 0.25 mg. tablet two or three times a day, available in bottles of 100.

Carbamates for pesticides

F. W. Berk and Co. Ltd. are offering development quantities of a range of carbamates, some of which are already in commercial use on the Continent. Certain related chemicals are used as pre-emergent herbicides, and others are alternatives to chlorine and phosphorus-based insecticides. These carbamates are claimed to be less toxic than phosphorus compounds and, unlike chlorinated insecticides, they are not absorbed or stored in animal fats. They may prove useful where resistance to DDT has been observed.

Among the carbamates which are now available are:

DIPHENYL URETHANE (ethyl N,N-diphenyl carbamate), a light-brown crystalline substance of molecular weight 241, which re-crystallises as white crystals with a melting point of 71°-72°C.

ETHYL PHENYL URETHANE (ethyl N-phenyl carbamate), a brown liquid of m.w. 193, which on distillation gives a colourless product.

METHYL PHENYL URETHANE (ethyl N-methyl N-phenyl carbamate), a brown liquid of m.w. 179, which on distillation gives a colourless product.

METHYL CARBANILATE (methyl N-phenyl carbamate), m.w. 151. It re-crystallises to white crystals which melt at 47°-49°C.

On reaction with alcohols and phenols, higher esters can be prepared under suitable conditions. Dicarbamates and unsymmetrical ureas can be prepared with glycols and amines respectively.



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Manufacturing Chemist—December, 1961

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Sodium Zirconium Lactate
Solution
Zirconium Sulphate Solution
Sodium Zirconyl Silicate
Sodium Hydroxide
(Pure and Commercial)

Packaging

B.S.S. for fibreboard drums

A new revision of B.S. 1596—fibreboard drums for overseas shipments—makes two major changes from the 1953 edition.

Firstly, dimensional requirements have been replaced by a specification of the relationship between height and diameter of the end. Secondly, there has been considerable change in the basis of specifying the drop test. The tests in earlier editions of the standard have been found to be more severe than is normally justified by present conditions. Heavier drums are likely to be subject to a lower drop than lighter drums, as it is felt that the heavier drums will now normally be handled mechanically, thus reducing the risk of drop and consequent damage.

Copies of this standard may be obtained from the British Standards Institution, 2 Park Street, London, W.1, price 5s.

Deep freeze pack for vaccine

Recently Sabin polio vaccine (Type 1) produced by Pfizer Ltd. of Sandwich was approved by the U.S. Public Health Authorities for sale in the U.S., and considerable quantities of the vaccine were shipped to America to deal with a serious polio outbreak in New York. The oral vaccine has to be kept frozen until just before administration and a 6 ft. long container was devised in order to provide a compact deep-freeze for the vaccine.

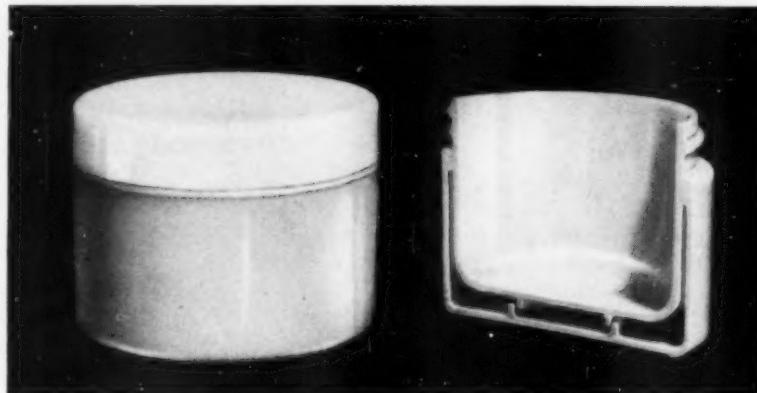
The container consists of 3 in. slabs of expanded plastic covered with hardboard. An inner vaccine container is placed inside this and on top of a layer of dry ice (solid CO₂). A 2 in. space between the two containers is filled with dry ice and the inner container loaded with vaccine. A recessed lid is placed on and a layer of dry ice on top. The lid of the main container is bolted down and sealed. At intervals around the container ventilation holes have been placed to allow the evaporated CO₂ to escape. The inner container is lined with aluminium foil to prevent contamination.

Packed in this way, the vaccine remains frozen at -60°C. for three or four days.

Diet food in multiple pack

Metal Box are supplying Winthrop Laboratories with cardboard sleeves, called Twinpaks, for tins of their Dramal diet food.

The sleeves are made of No. 1 white lined chipboard. The decoration in black, yellow, and light grey is printed by offset lithography.



The new Dines polystyrene double walled cream jar, with colour matching or contrasting polystyrene screw cap, is available in two capacities, 2 oz. and 4 oz., from Dines Plastics Ltd. The jars are impermeable enough to hold most cream products and they can be printed on up to a maximum of four colours.

Two tins of the food, one plain, the other chocolate flavoured, are enclosed in the packs which have a pair of lugs cut in the centre of their base. The lugs face outwards towards the ends of the sleeve and are folded back into the pack and the cans pushed over them so that they spring upward to engage on the inside of the rims at the base of the cans where they are in contact in the centre of the pack.

Bronchodilator applicator

Benger Laboratories Ltd. have introduced a new modified "Lomulizer." This simplified applicator is designed to disperse Lomudase to facilitate removal of viscid mucoid sputum, and Lomufren, an efficient bronchodilator, throughout the respiratory tract.

The trade price of the new lomulizer is 3s. 4d.; retail price 5s.

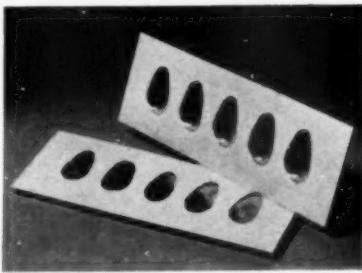


Deep-freeze container for oral vaccine.

THE JANUARY ISSUE

Here are some of the articles
you can read in next month's
"Manufacturing Chemist"

FINE CHEMICALS FROM COAL TAR
SMALL-SCALE MIXERS
THE SCENT OF FLOWERS AND
LEAVES
GRINDING EQUIPMENT



A new-style Bubblepak to hold small items that are required one at a time in separate air-tight and moisture-proof compartments, introduced by Gordon and Gotch Ltd. The bubbles can be emptied by finger pressure.



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are highly saturated, stable materials, suitable for the manufacture of toilet and cosmetic preparations.

Shell Light Liquid Paraffin B.P., Shell Liquid Paraffin B.P., Shell White Petroleum Jelly B.P. and Shell Amber Petroleum Jelly B.P. all meet the requirements of the British Pharmacopœia and are supplied for medicinal and pharmaceutical purposes.

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SHELL PROCESS OILS

Manufacturing Chemist—December, 1961

A63

The Chemical Market

LONDON.—Prices have been dull this month. **Glycerine** dropped a further £10 per ton. **Citrates** generally were down by 1d. per lb. following last month's fall in the price of citric acid. There were few changes in essential oils. **Anise** went up 8s. 3d. per lb., but most other oils slipped, owing to small demand. Among metals, **copper** did not maintain its rise and finally dropped slightly by £1 per ton. **Zinc** went down by £3 10s. per ton and **lead** only reached £59 per ton, the lowest for some considerable time.

FINE CHEMICALS

Acetanilide	2s. 10d. lb. (cwt.)
Adrenaline B.P.	£43 15s. kg.
Aluminium hydroxide B.P.	7s. lb. (cwt.)
Aluminium lithium hydrate	120s. (100 g.)
Arsenic trioxide	£37 ton
Ascorbic acid	51s. kg.
Aspirin	4s. 8d. lb.
Atropine sulphate B.P.	£59 1s. kg.
Auranton	28s. 6d. lb.
Barbituric acid	44s. kg.
Benzoic acid B.P.	2s. 9½d. lb. (cwt.)
Benzyl benzoate	5s. lb. "
Bismuth salts	
Carbonate B.P.	20s. lb.
Subnitrate	18s. "
Borax B.P.	£60 ton
Boric acid B.P. Gran.	£90 10s. "
Bromine B.P.C.	6s. lb.
Caffeine	32s. kg.
Calciferol	3s. 9d. g.
Calcium gluconate	3s. 7d. lb.
Calcium glycerophosphate	12s. "
Calcium lactate B.P.	2s. 4d. "
Chloral hydrate	9s. 4d. kg.
Chloramine T	4s. 2d. lb.
Citric acid B.P.	156s. cwt.
Citronellol	22s. lb.
Codeine	£138 10s. kg.
D.D.T. Tech.	3s. lb.
2 : 4 Dichlorophenoxyacetic acid	£310 ton
Ephedrine hydrochloride	140s. kg.
Eucalyptol	11s. lb.
Eugenol	19s. "
Ferri ammon. citrate B.P.	4s. 5½d. "
Gallic acid B.P.C.	12s. 3d. "
Geranyl acetate	17s. 6d. "
Gluconic acid	22s. 6d. "
Glycerophosphoric acid	4s. 7d. "
Glycine	8s. 3d. "
Hexamine B.P.	1s. 11½d. "
Hexyl Resorcinol	150s. "
Hydroquinone	8s. 6d. "
Iodine, crude	17s. 4d. kg.
Iodoform	24s. 1d. lb.
Lactose	132s. 6d. cwt.
Lithium carbonate	4s. 10d. lb.
Lysine hydrochloride	23s. (100 g.)
Magnesium carbonate B.P. Heavy	185s. cwt.
Magnesium trisilicate	3s. 1d. lb.
Manganese hypophosphite B.P.C.	12s. 11d. lb.
Mercurous chloride B.P.C.	52s. 3d. kg.
Methyl salicylate	3s. 3d. lb.
Musk xylol 100%	10s. 6d. lb.
Nicotinamide	50s. 6d. kg.
Nicotinic acid	32s. 9d. "
Nitrobenzene	11d. lb.
Octyl acetate	9s. lb.
Paraformaldehyde	1s. 3½d. "

Pentachlorphenol	2s. 4d. lb.
Peracetic acid	2s. 8d. "
Phenol Ice Crystal	1s. 4d. "
Phenolphthalein	9s. "
Phosphoric acid B.P.	1s. 4d. "
Potassium permanganate B.P.	2s. 1½d. "
Procaine hydrochloride	45s. kg.
Pyridine 90/160	22s. 6d. g.
Quinine sulphate	1s. 9½d. oz.
Riboflavin	5½d. g.
Saccharine	
Soluble	80s. 10d. lb.
Insoluble	99s. 10d. "
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Sodium carboxy methyl cellulose	Tech. £185 ton
Sodium lauryl sulphate B.P.	4s. 6½d. lb.
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Sorbitol	
Powder	3s. 3d. lb.
Syrup	1s. 9½ " "
Stannic chloride	8s. 11d. "
Stannous chloride	9s. 5d. "
Strychnine	10s. oz.
Sulphaguanidine	11s. lb. (cwt.)
Sulphanilamide	5s. 9d. "
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Tannic acid B.P.	Levis 10s. "
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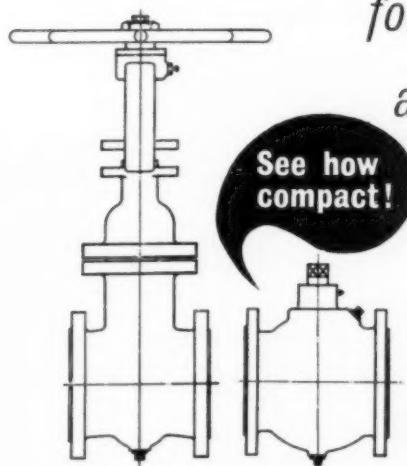
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Compositions containing 3-amino-1,2,4-triazole for use in the economic eradication and/or suppression of undesirable plant growth. *Amchem Products Inc.* 876,461.

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P. J. Clegg Ltd. 14.9.61. 6 Park Grove, Cardiff. Chemists, etc. £500. Dirs.: Philip J. (perm.) and Nancy J. Clegg.

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G.S. Chemicals Ltd. 26.9.61. 1 Bishops Court, Sundridge, nr. Sevenoaks. £500. Dirs.: Francis J. G. and Gerda E. O. Graham.

Vapon Ltd. 28.9.61. 37 Mackenzie St., Slough. £100. Mnfrs. of and dlr.s. in pharmaceutical goods, etc. Dirs.: Eric and Sylvia Tieche, 97 Barnhill, Wembley.

D.D.S.A. Pharmaceuticals Ltd. 29.9.61. £1,000. Subs.: M. Russell, 23 Portman Sq., London, W.1, and G. Gee.

Lakeside Chemists Ltd. 29.9.61. 9 Wearwater Way, Lakeside Estate, Roath Park, Cardiff. £5,000. Dirs.: Colin H. and Doris H. Clode.

Blue-Nile (Cosmetics) Ltd. 21.10.61. 55 George St., London, W.1. £100. Subs.: George Head and Ronald A. Goodliffe.

Sun Chemical Corp. (U.K.) Ltd. 22.9.61. £100. mnfrs. of and dlr.s. in poly-styrene foam and other chemical products, etc. Dirs.: Wm. J. Fullerton, 73 Gt. Peter St., London, S.W.1, and Norman E. Alexander.

Ivo M. Lechner Italian Labs. Ltd. 29.8.61. 158 Fenchurch St., London, E.C.3. Mnfrs., importers and exporters of and dlr.s. in cosmetics, etc. £5,000. Subs.: Ian Reid and K. O'Neil.

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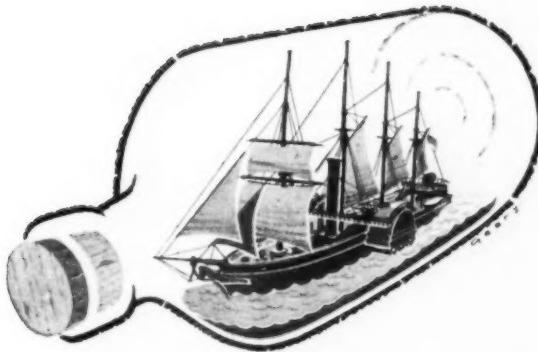
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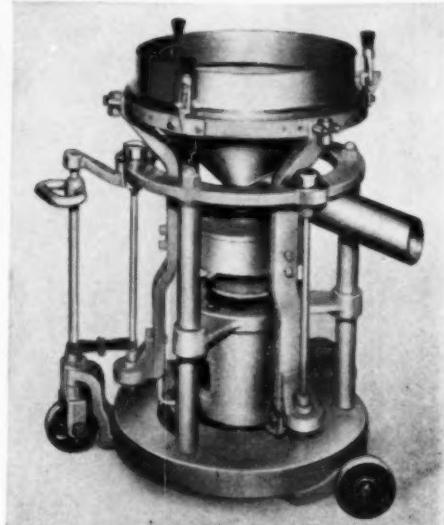
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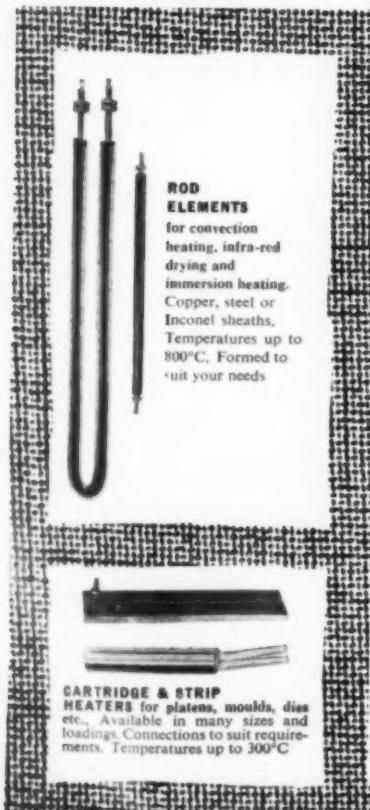
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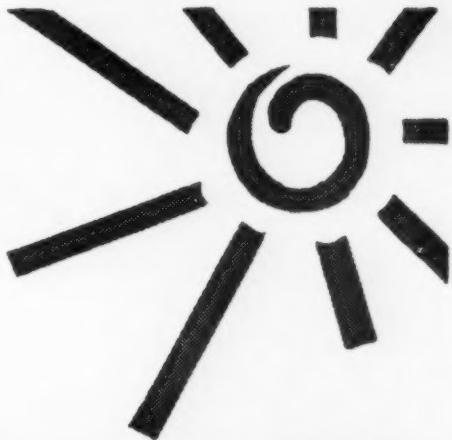
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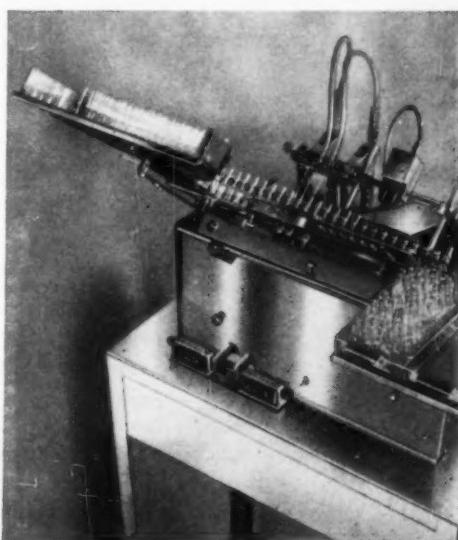
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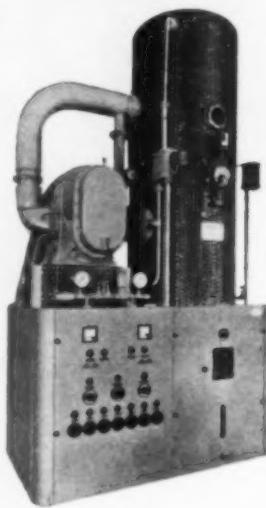
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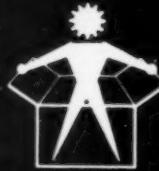
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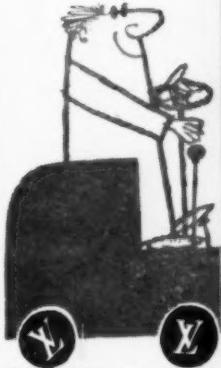
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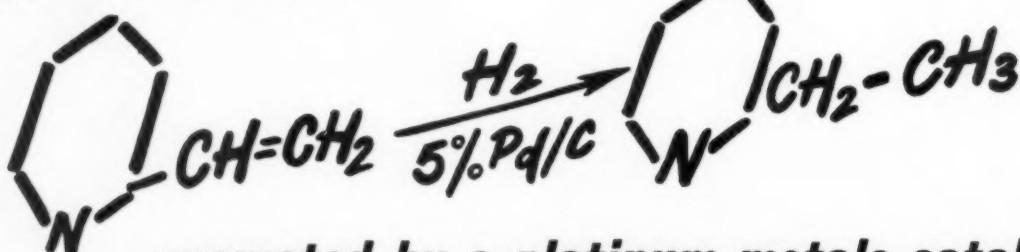
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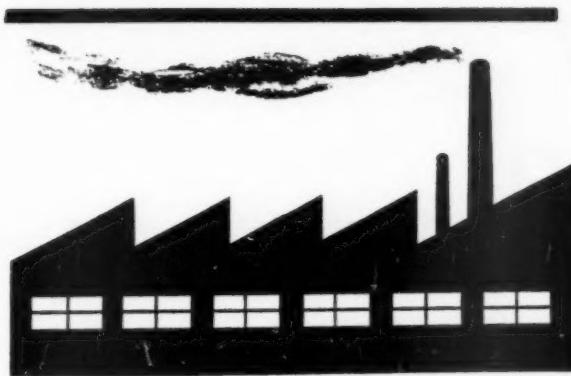
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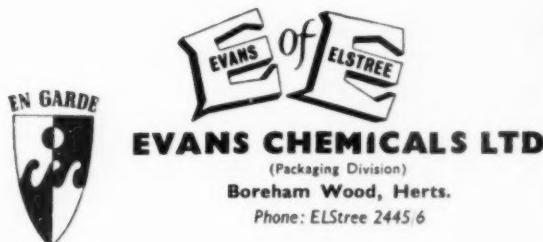
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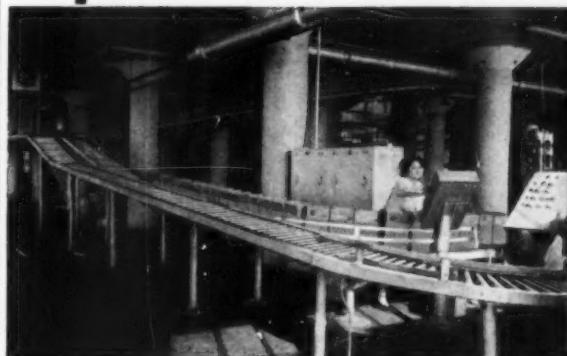
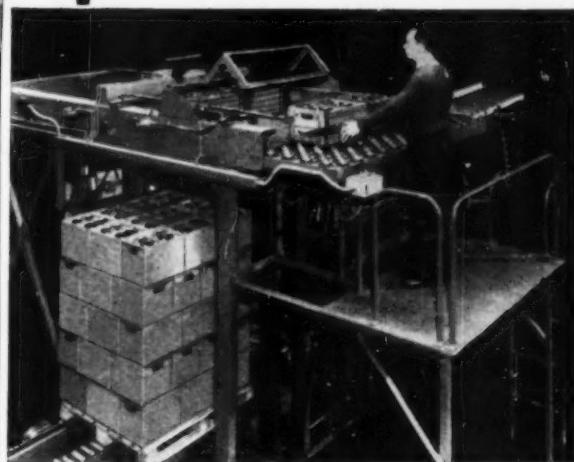


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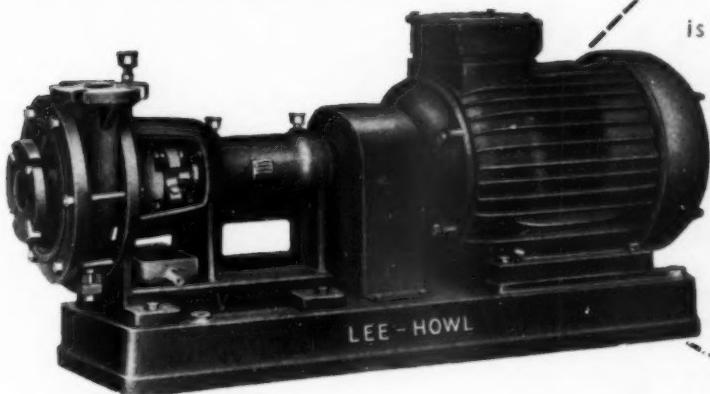
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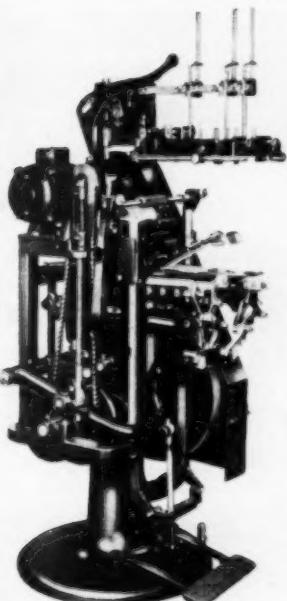
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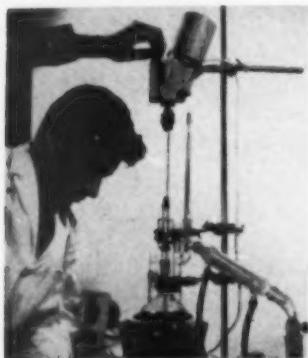
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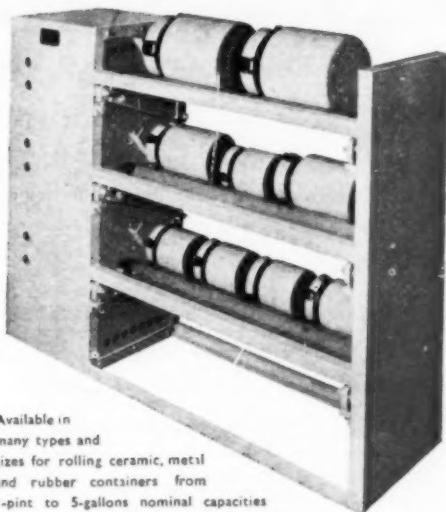
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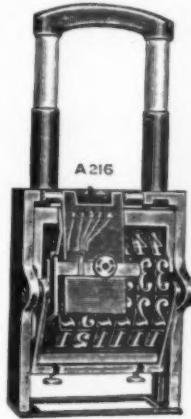
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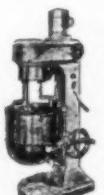
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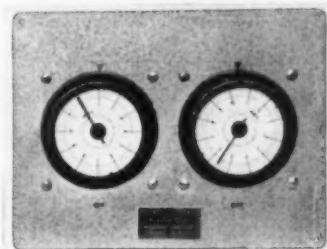
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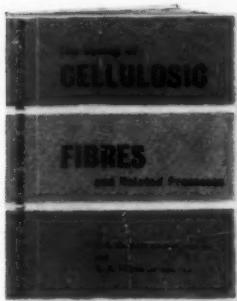
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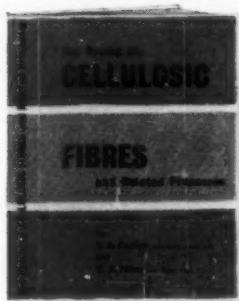
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